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China's Products and War Requirements

The Raw Materials of China which might be Organized and Mobilized under War Conditions to be of Greater Benefit to the Country in coming Times of Peace

Under ordinary peace conditions there are a great many manufactures in which it would be difficult for China, without a well organized pool of capital, to build up industries and an export trade. Under existing war conditions there are practically few such commodities, and under either war or peace conditions it is always possible, shipping being adequate, to market abroad almost any of China's raw materials.

Under conditions of keen competition China has always been able to dispose of all her surplus products for which transport could be found, and, thinks to the efforts of the foreign buyers, who have simply worked upon the outer fringe of China's possibilities, rather than to the enterprise of Chinese producers, a very good foundation for an export trade has been laid in peace times.

It was naturally to have been expected, therefore, that China would have done remarkably well during the war. One would expect to hear of a rapidly developing Chinese merchant marine, of the growth of exports of raw materials to an unprecedented figure, and of a phenomenal stride in native manufactures to take the place of the countless commodities formerly imported into the country from the nations now at war and now reduced by the scarcity of ships, the high freight rates, and the increased needs of the Occident, to a meager minimum.

Japan has done remarkably well during the three years of strife in Europe. She has cancelled debts, built huge industries, and has increased her gold reserve enormously through supplying the increased demands abroad and by replacing imports with newly developed native manufactures. Japan of course had a better start than China, but where there was so much wealth to be harvested, and where there was such an unlimited opportunity for commercial and industrial expansion, one would expect China to take some advantage of it and reap some perceptible benefit.

Yet if the benefit is perceptible, it is scarcely so. If China has developed a bigger export trade it is because there has been such a demand for certain materials that others were willing to take the trouble to come after them, and not because China made any effort to advertise or sell her wares.

When commodities for which a demand had been created ceased to be imported from Europe the Chinese did without them and waited patiently for the Japanese to develop the manufactories that could replace them; and while other neutral nations have been buying, building, and refloating every conceivable kind of craft, China has purchased part interest in one steamer and has not laid an ocean-going keel.

While all but the belligerent peoples were amassing great wealth the Chinese people have resigned themselves to even greater poverty and discomfort, and have consoled themselves with the thought that after the war there is going to be such a big interest in China that all the nations of the earth will send their experts to China to develop her natural resources, her industries, and her commerce for her. The whole attitude is one of self-recognized dependence, sloth, and incapacity. The officials have the excuse of constant internal turmoil! The people who enable the turmoil to continue have no excuse!

Now as a venture into international politics, China has declared war, and by doing so has assumed the responsibility of assisting the nations which are bearing the chief burden of the suppression of German militarism, either in a military way or economically.

The best service that China can do herself and her Allies if she hopes to share any part of the responsibility which she has assumed in declaring war upon Germany, is—apart from supplying labor, and perhaps some troops—to attempt to do something to relieve the economic strain on the active belligerents, to mobilize her products, increase her exports, lay the foundations of a shipping industry, and at the same time adapt such manufactures as she has to modern needs. It need not be pointed out that in making such efforts she would, at the same time, be doing herself a very good turn, just as Japan has done very handsomely by herself in supplying the pressing needs of Russia throughout the war.

Some realization of this present responsibility and of the future benefit involved, is displayed by the Chinese General Chamber of Commerce which has organized a society for the study of the development of trade and industry, and by the Ministry of Agriculture and Commerce which is exhorting the Chambers of Commerce to increased industrial effort in general terms and is about to establish Provincial Industrial Bureaux for the study of local commercial and industrial problems and for the encouragement of existing local crafts and industries.

The first essential to the development of trade and industry, as the Chambers of Commerce remind the Government when they are exhorted to build mills, is that the Government make trade and manufacturing possible in the interior by the abolition of likin (internal customs) and by the systematization of taxes upon industries. The second essential—to export trade at any rate—is the provision of adequate shipping to carry goods abroad. The third essential is a knowledge of what is actually wanted abroad, in what form it is most acceptable, how it should be packed, and how it should be shipped. If the Chinese Government will address itself to these three needs of the commercial classes there is some hope that the merchants and manufacturers will arouse themselves from their enforced lethargy and use such time as is at their disposal to prepare China for the promised commercial descent upon her resources when the commercial fleets of the world are free after the war.

Chinese taxation upon local industries is one of the strongest deterrents of industrial development. The local official in each community has great liberty in the imposition of taxes, upon all products except those which are government monopolies or upon which there are fixed federal taxes, and every factory erected seems to be regarded by the local magistrate as an institution built specially to be taxed, and a new industry interests officials in proportion to the promise it gives of yielding taxes directly or indirectly.

The likin system, which serves to discourage the transport of goods from one district to another, or from one province to another, is a permanent discouragement to trade, as the likin on many railways and trade routes is in excess of the carrying charges. Even the customs tariffs, as the report upon foreign trade in 1916 shows, make it difficult for Chinese manufacturers to compete with foreign importers of manufactured goods, thanks to the high tariffs on raw materials needed in China and the low tariffs on imported goods which compete with the Chinese native commodities. A little intelligent study on the part of the Government, combined with an honest desire to foster native trade, in place of the irresistible tendency shown to bleed it, would convince the officials who appeal to the Chambers of Commerce to build mills and promote industries in such casual and general terms, that the government can do much towards paving the way for such development if it sees fit.

Shipping Shortage is Problem

The shipping shortage is the most difficult problem which the Chinese Government and the Chinese commercial folk have to solve if they hope to build up an export trade, either in the interest of the belligerent Allies or in their own interest, before the end of the war.

Apart from the few well-organised foreign ship-building concerns in Hongkong and Shanghai and the Kiangnan Dock yard, there are no commercial yards in China equipped to build ocean going craft, but the whole subject should receive immediate intelligent attention.

To found a ship-building industry China must unhappily build from the ground up. Her best mines are all operated by foreign firms—Japanese for the most part—and her only well equipped iron works are foreign operated. The confiscation of the interned Austrian and German ships has given the Chinese a nucleus for a merchant marine, but unless officialdom undergoes a marked change the chances of its growing during the war are very small indeed.

For the transport of her exports China will therefore have to rely very largely upon the very poor service which she now gets and upon any increase that there may be in the Japanese merchant marine. Overland trade with Russia, both by rail and caravan, can be built up to some extent, although the low rouble exchange makes such traffic difficult.

Chinese merchants stand in even greater need of well informed direction of their enterprises than they do of shipping at this juncture, and in obtaining information and supplying it to Chinese agriculturists, manufacturers, local traders and exporters, the Chinese Government is particularly inefficient.

Judging from what is going on in other parts of the world, the scarcity of ships is not so great but that bottoms will be found to convey whatever is pre-eminently well suited to the needs of the nations at war.

However scarce ships are and however high the freights, Chinese merchants can feel assured that if field artillery were manufactured in China, of such a quality that it would be of service in Europe, there would be steamers arriving regularly from Europe to take it. If China can supply staple foods which are essential to Europe and scarce at this juncture, the warring nations will find ways of conveying these staples from China to London.

It should be the particular care of the Chinese Government from this time forth to learn just what is wanted abroad, where and how China can produce it, whence and how it can be shipped, and what improvements upon present Chinese manufacturing, agricultural, and shipping methods are needed throughout the country. Such information, once obtained, should be diffused among the merchants, farmers and people by every possible medium of publicity, while experts, whether foreign or Chinese, in every line that is worth developing should be sent into producing and manufacturing districts to encourage and instruct people.

China has built up a market abroad for tea, silk, raw cotton, vegetable and wood oils, fertilizers, wool, hides, metals, for the most part unrefined, seeds, and many minor products nearly all in the raw state.

The export of manufactured goods is trifling as compared with the shipments of raw materials, and the chief reason for this is that the Chinese do not know how to manufacture to meet foreign demands. Very few buyers of Chinese products have any interest in instructing the Chinese upon these points, for they buy for manufactories, and only the purchasers of characteristic Chinese goods, taken abroad as curios, are seriously interested in seeing Chinese develop their manufactures to the satisfaction of foreign taste. The result is that what little the Chinese do manufacture does not suit the foreign market and has no sale abroad. Even in the manufacture of silk thread, spun for the manufacture of silk fabrics abroad, the Chinese fail to satisfy foreign weavers, simply because their skeins are not adapted to foreign looms and because they are not tied to suit the convenience of the buyers. This seems a trifling matter, but it is not so trifling when one remembers that the Japanese export of silk has increased nearly a million pounds a year for the past 25 years, while the Chinese increase has been about one-eighth of that amount, although Chinese silk is considered vastly superior to Japanese silk.

The possibility of building up profitable industries in China has been constantly negatived by the ignorance and helplessness of the would-be manufacturer, and every year has seen mines opened, factories built, and agricultural enterprises started which are closed in a few months with the discouragement and disgust of the promoters, thanks either to their ignorance of working methods or of market requirements. The result is that the Chinese would much rather sell their products as they come out of the ground, or out of the field, or off the backs of their live stock, than risk tampering with them. Cereals, upon which the Chinese Government places an embargo, would be a great boon to the Allies, and China has vast desolate plains in the North which might just as well be growing wheat, barley and maize for the Allies. The removal of the embargo on beans in Manchuria has afforded an opening for the development of the biggest and most profitable trade in Manchuria, and nobody lacks beans in his diet. The same would certainly be true of other cereals if China were to encourage proper methods of cultivation, the development of waste land, and the export of the cereal surplus.

China's Import Needs

While they are casting about for a means of shipping standard exports the Chinese Government might do much for the manufacturers and producers by demonstrating how they can replace the imports for which a demand has been created, but which the war has cut off. China needs kerosene, electrical machinery and supplies, paper, printing materials and machinery, railway materials, soaps, medicines, woollen and cotton fabrics, bicycles, and many other articles which have become scarce since all the manufactories of the Occident have taken to manufacturing war supplies, and since freight rates are so high.

The American ban on steel, machinery, and other staple exports to the Orient, will create a still greater scarcity of imports, and if China sets up factories which will supply the deficit in her own country she will not only use up the raw materials which cannot be readily exported, and supply her own people with articles which are now too expensive to import, even when they are available, but she will lay the foundation for manufactures which may be of direct benefit to the Allies before they are finished with the war. Activity along any line suggested depends largely upon Government initiative. Conditions must be made easier for the producer and the manufacturer, instruction in both local and foreign market requirements must be liberally supplied, and whenever possible transportation arrangements should be made so that whatever China produces will be disposed of to the best advantage of the Allied nations at war and of the Chinese merchants. The mere injunction "build factories and increase industries" is rather irritating than encouraging to the Chambers of Commerce which have watched China's opportunities pass while all other nations have been accumulating wealth.

And if the Government wish the greatest advantage in promoting the establishment of industries on modern lines, we earnestly appeal to the officials who may be concerned to take no steps without competent advice. That advice is available. Most of the machinery selling foreign firms in China have experts at their disposal and they will be glad to co-operate with the Government. All the advertisers in the FAR EASTERN REVIEW are equipped to render the best and most lasting assistance, and we commend these experts to the Government. The time has now come, under the impetus of war, when China might take the steps to put the nation upon the highroad to a higher standard of living than that which has been accepted for centuries, and to do that industries must be established throughout the country. Facilities should be given to Chinese to work up their raw material unhampered by the vampirish provincial official, and to the foreign machinery expert to assist them untrammelled by short-sighted, provocative and stupid regulations drafted at a time when China believed herself to be the one great nation in the world and all the rest of the people of the earth to be barbarians fit only to pay tribute to her. Ideas have changed now, and regulations ought likewise to be revised. If China is to benefit by the war as other nations have benefitted and will benefit, she must be up and doing, exhibiting wisdom in her treatment of those who can help her and intelligence in the handling of those questions which must be tackled to permit her people to take advantage of the means that are available to develop the country and raise the standing of China in the comity of nations. The country should be thrown open to trade, facilities should be provided the people to buy, to instal, and operate machinery, and irksome regulations preventing foreign assistance being given either in the shape of brains or capital should ruthlessly be removed. That is China's only way to become great.

Chinese as Agriculturists

An examination as to what China might have to offer in the way of war supplies brings it home forcibly to investigators that the Chinese are chiefly farmers—or officials. They are pre-eminently farmers, and agriculture is the chief occupation of the populace. The land has been compelled not only to provide the food for the nation for centuries but also most of the taxation to enable the officials to secure the wherewithal to govern and to live and be rich.

The ancient classification of people in China put the cultivators third in the list, the first being the scholars, the second the trading people, who dealt in "produce from the four quarters"—which meant, according to Parker, chiefly cattle, grain, silk, horses, leather and gems. The handicraftsmen came last in the list. In those days the cultivator knew nothing of tea and cotton and other important products of to-day. In Kuan-tsz's time—about 686 B.C.—the agriculturists came last in the category, but in more recent times the agriculturist has come into his own, and is now placed after the scholars, for it was realised that "the King himself is served by the field." Shen Nung, one of the legendary Emperors of China, who is described as "the divine husbandman," and who is supposed to have lived some 2,737 years before Christ, is credited with the invention of the wooden share and the wooden handles for the plough, as well as teaching the value of ploughing and weeding. He too established the first markets, then opened in the middle of the day in various centres for barter and exchange.

The connexion thus established between the Throne and the plough has been kept up through the succeeding ages. The Emperor, up to the time of the establishment of the Republic, every year turned a furrow at the Temple of Agriculture, with a royal plough, to inaugurate the beginning of the farming season, and every Viceroy in every province followed the royal example. And, as Douglas points out, with the same desire to set an example to her sex, the Empress, so soon as the mulberry trees broke into foliage, followed the gentler craft of picking the leaves to supply food for the palace silkworms. "Give chief place," wrote the Emperor Kanghsi, "to husbandry and the cultivation of the mulberry tree, in order to procure adequate supplies of food and raiment," to which excellent advice his son added, "Suffer not a barren spot to remain in the wilds or a lazy person to abide in the cities; then a farmer will not lay aside his plough and hoe, nor the housewife put away her silkworms or her weaving." These commands have sunk deep into the national character, and the greatest devotion to their calling, sharpened it is true by a keen sense of self-interest, adds Douglas, is everywhere shown by the Chinese farmers. From these men it is impossible to withhold the highest praise for their untiring industry. With endless labour and inexhaustible resource they wrest from the soil the very utmost that it is capable of producing.

Because of his tremendous industry, because of his tireless search for and utilization of any spot of cultivable soil the intensity of Chinese cultivation, and the results obtained have given the Chinese a world-wide reputation as farmers, and there is reason for it. In his excellent book "Farmers of Forty Centuries," Mr. F. H. King has much information to give on the subject and much of interest to say about it. According to him many factors and conditions conspire to give to the farms and farmers of the Far East their high maintenance efficiency, and some of these he succinctly states as follows: The portions of China, Korea and Japan where dense populations have developed and are being maintained occupy exceptionally favorable geographic positions so far as these influence agricultural production. Canton, in the south of China, has the latitude of Havana, Cuba; while Mukden, in Manchuria, is only as far north as New York city, Chicago and Northern California. The United States lies mainly between 50 degrees and 30 degrees of latitude while these three countries lie between 40 degrees and 20 degrees, some seven hundred miles farther south. This difference of position giving them longer seasons has made it possible for them to devise systems of agriculture whereby they grow two, three and even four crops on the same piece of ground each year. In Southern China, in Formosa, and in parts of Japan, two crops of rice are grown; in the Chekiang Province there may be a crop of rape, of wheat or barley, or of windsor beans or clover, which is followed in mid-summer by another of cotton or of rice. In the Shantung Province wheat or barley in the winter and spring may be followed in summer by large or small millet, sweet potatoes, soy beans, or peanuts.

The rainfall is not only larger than that even in the Atlantic and Gulf states of America, but it falls more exclusively during the summer season when its efficiency in crop production may be highest. South China has a rainfall of some eighty inches, with little of it during the winter, while in the southern states of America the rainfall is nearer sixty inches with less than one half of it between June and December. Along a line drawn from Lake Superior through Central Texas, the yearly precipitation is about thirty inches, but only sixteen inches of this falls during the months, May to September; while in the Shantung Province of China, with the annual rainfall of little more than twenty-four inches, seventeen of these fall during the months designated, and most of this in July and August. When it is stated that under the best tillage and with no loss of water through percolation, most of the agricultural crops in America require 300 tons of water for each ton of dry substance brought to maturity, it can be readily understood that the right amount of available moisture coming at the proper time must be one of the prime factors of a high maintenance capacity for any soil, and hence that in the Far East, with their intensive methods, it is possible to make their soil yield large returns.

The selection of rice and of the millets as the great staple food crops of these three nations, and the systems of agriculture they have evolved to realise the most from them, are to us remarkable, and indicate a grasp of essentials and principles which may well cause western nations to pause and reflect.

Notwithstanding the large and favorable rainfall of these countries, each of the nations have selected the one crop which permits them to utilise not only practically the entire amount of rain which falls upon their fields but in addition enormous volumes of the run off of adjacent uncultivable mountain country. Wherever paddy fields are practical there rice is grown.

Efficiency in Crop Production

To any one who studies the agricultural methods of the Far East in the field, it is evident that these people, centuries ago, came to appreciate the value of water in crop production as no other nation has. They have adapted conditions to crops and crops to conditions until with rice they have a cereal which permits the most intense fertilization and at the same time the insuring of maximum yields against both drought and flood. With the practice of western nations in all humid climates, no matter how completely and highly we fertilize, in more years than not yields are reduced by a deficiency or an excess of water.

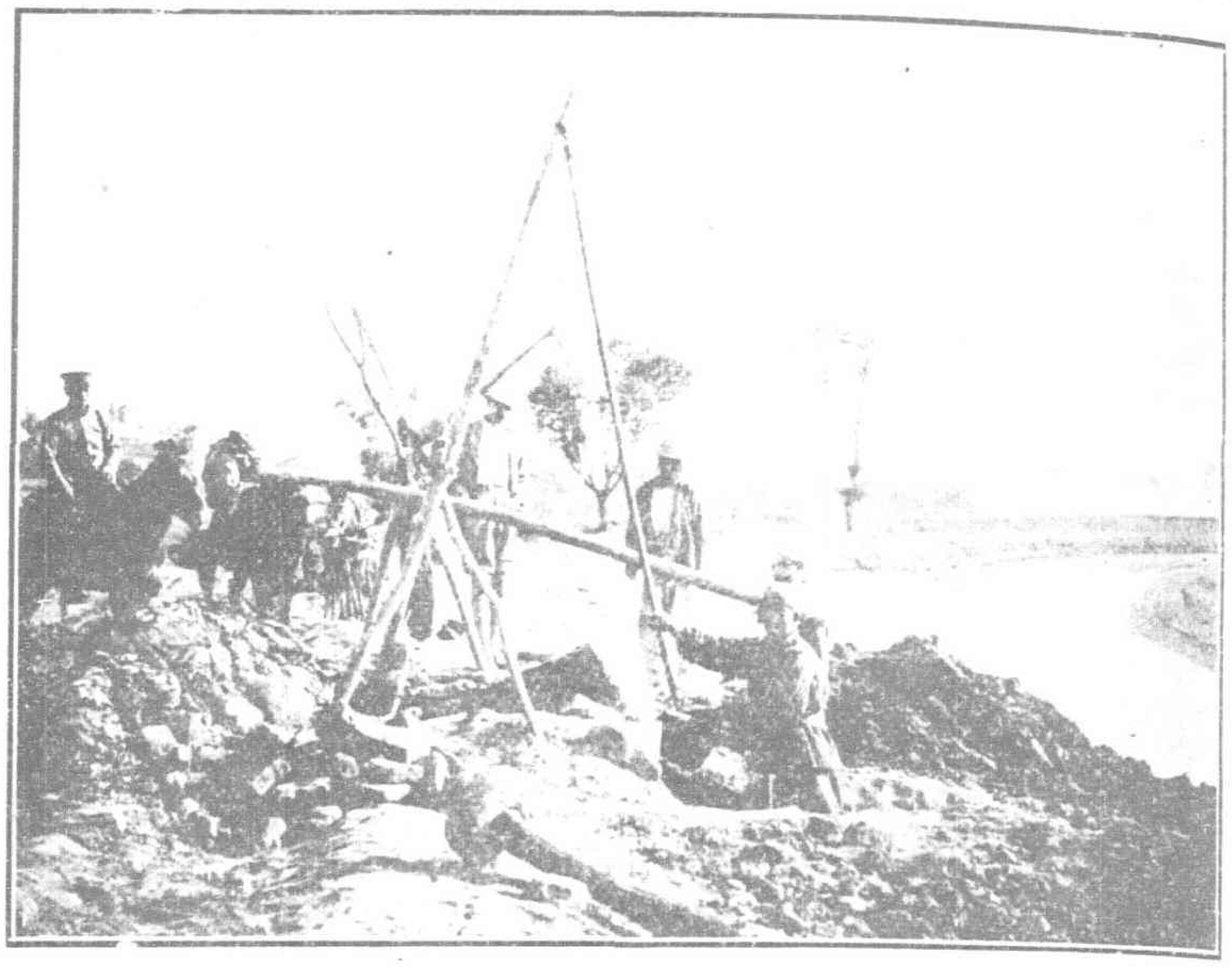
It is difficult to convey by word or map an adequate conception of the magnitude of the systems of canalization which contribute primarily to rice culture. A conservative estimate would place the miles of canals in China at fully 200,000 and there are probably more miles of canals in China, Korea, and Japan than there are miles of railroads in the United States. China alone has as many acres in rice each year as the United States has in wheat, and her annual product is more than double and probably threefold the American wheat crops, and yet the whole of the rice area produces at least one and sometimes two other crops each year.

The selection of the quick-manuring, drought-resisting millets as the great staple food crops to be grown wherever water is not available for irrigation, and the almost universal planting in hills or drills, permitting inter-tillage, thus adopting centuries ago the utilization of earth mulches in conserving soil moisture, has enabled these people to secure maximum returns in seasons of drought and where the rainfall is small. The millets thrive in the hot summer climates; they survive where the available soil moisture is reduced to a low limit, and they grow vigorously when the heavy rains come.

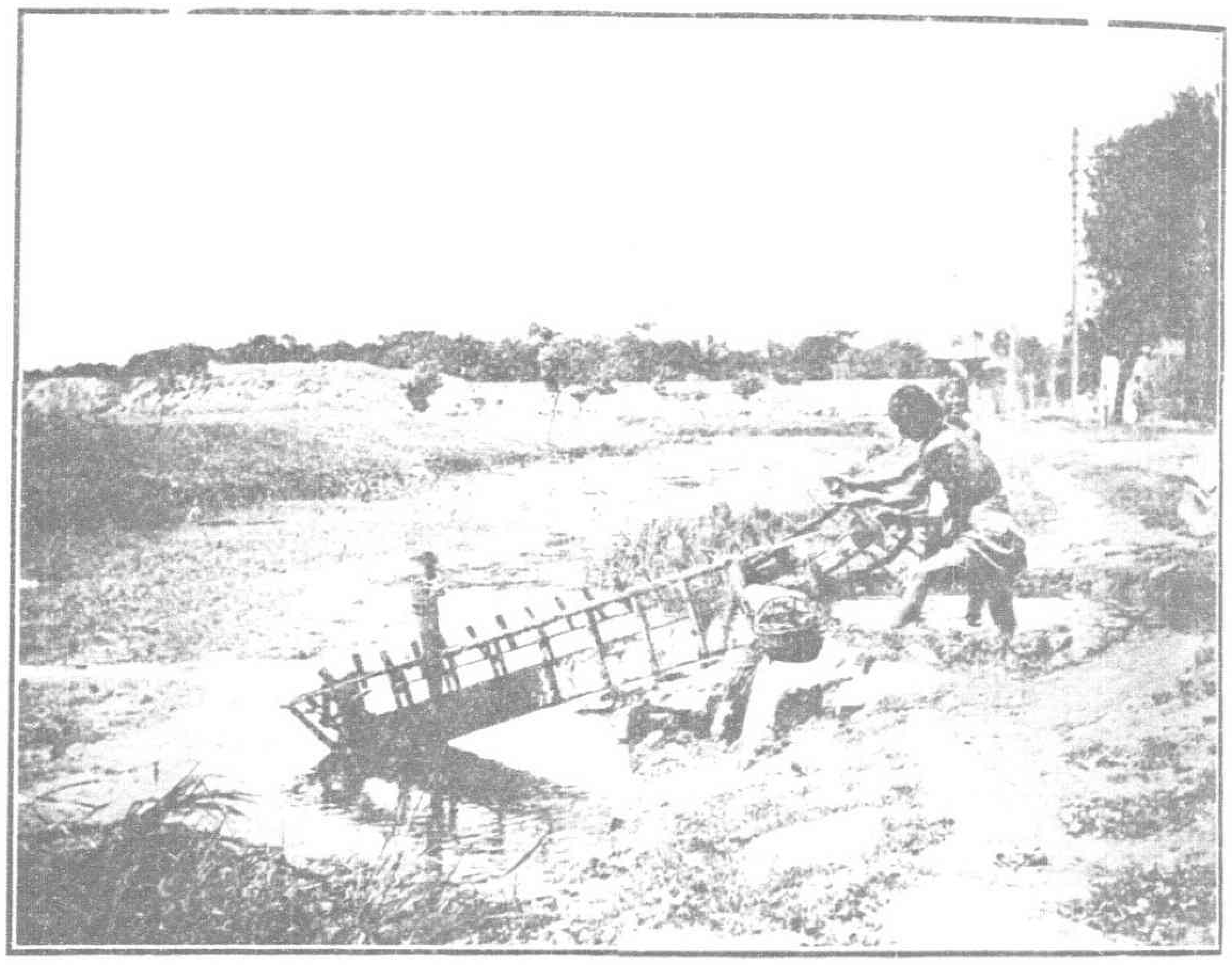
Thus we find in the Far East, with more rainfall and a better distribution of it than occurs in the United States, and with warmer and longer seasons, that these people have with rare wisdom combined both irrigation and dry farming methods to an extent and with an intensity far beyond anything our people have even dreamed in order that they might maintain their dense population.

Intensive Fertilization

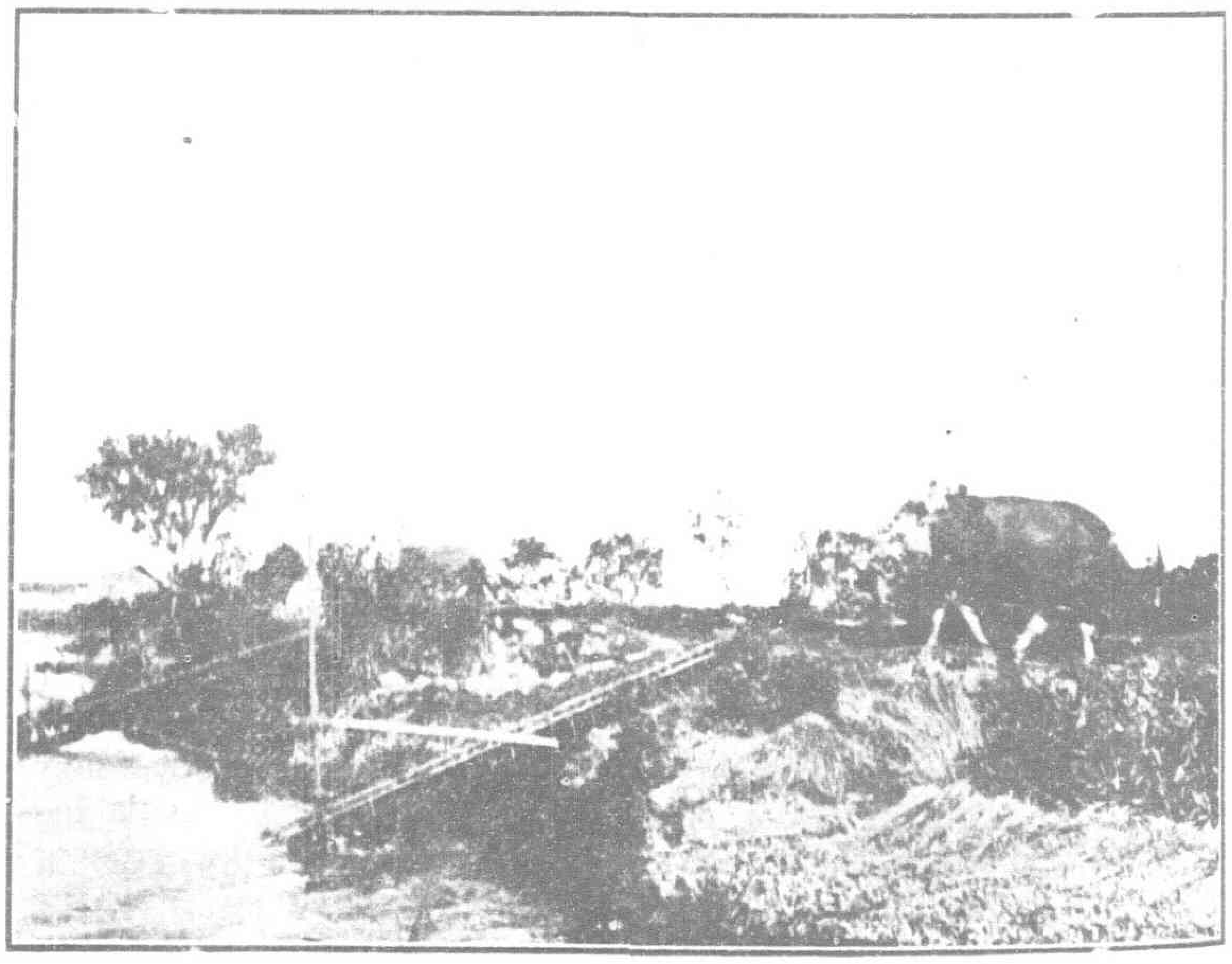
Notwithstanding the fact that in each of these countries the soils are naturally more than ordinarily deep, inherently fertile and enduring, judicious and rational methods of fertilization are everywhere practiced; but not until recent years, and only in Japan, have mineral commercial fertilizers been used. For centuries, however, all cultivated lands including adjacent hills and mountain sides, canals, streams, and the sea, have been made to contribute what they could towards the fertilization of cultivated fields, and these contributions in the aggregate have been large. In China, in Korea, and in Japan, all but the inaccessible portions of their vast extent of mountain and hill lands have been long taxed to their full capacity for fuel, lumber, and herbage, for green manure and compost material; and the ashes of practically all of the fuel and of all of the lumber used in the home finds its way ultimately to the field as a fertilizer.



IRRIGATING BY WELL SWEEP (SHANSI)

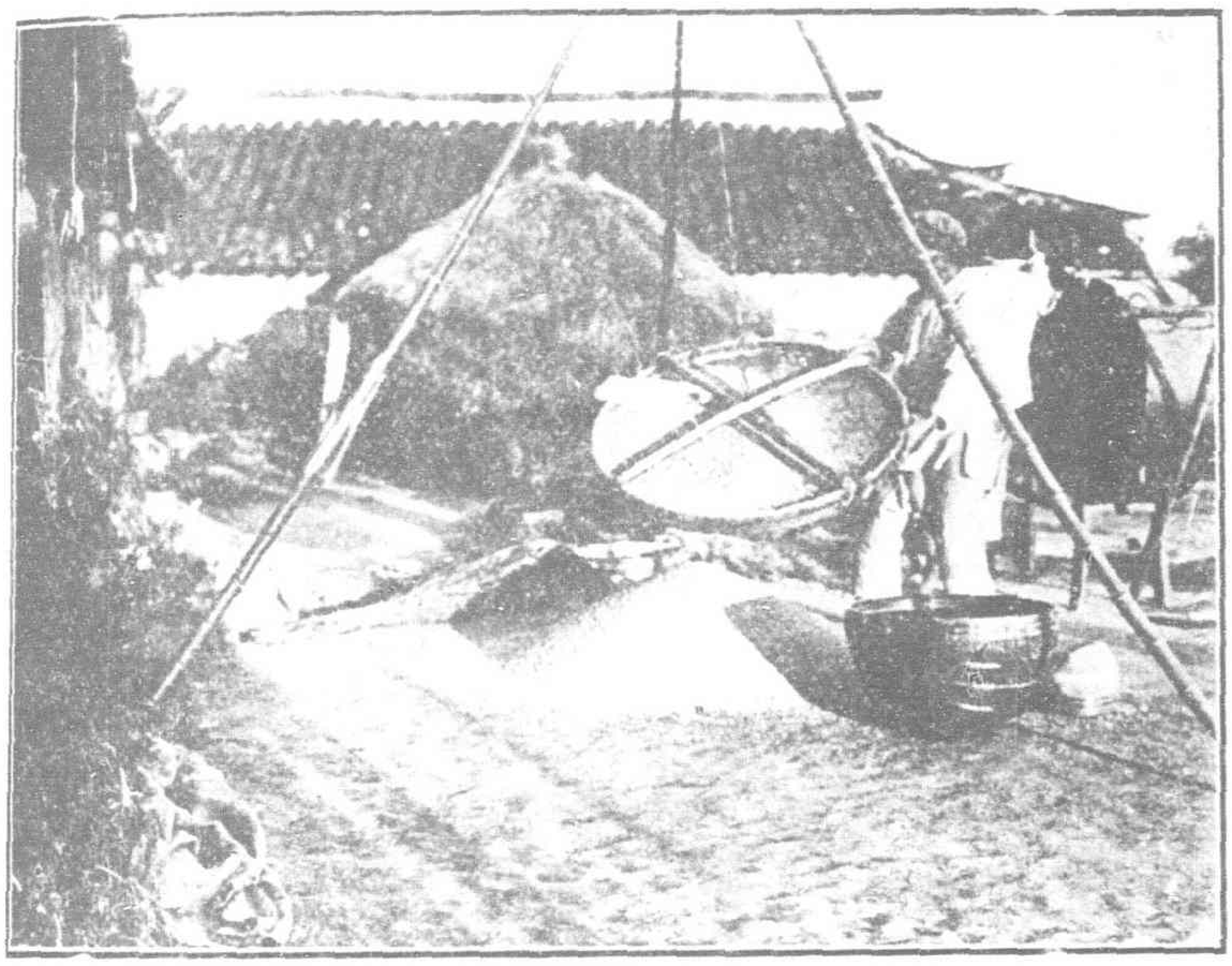


IRRIGATING BY ENDLESS CHAIN AND PADDLES, OPERATED BY MAN POWER

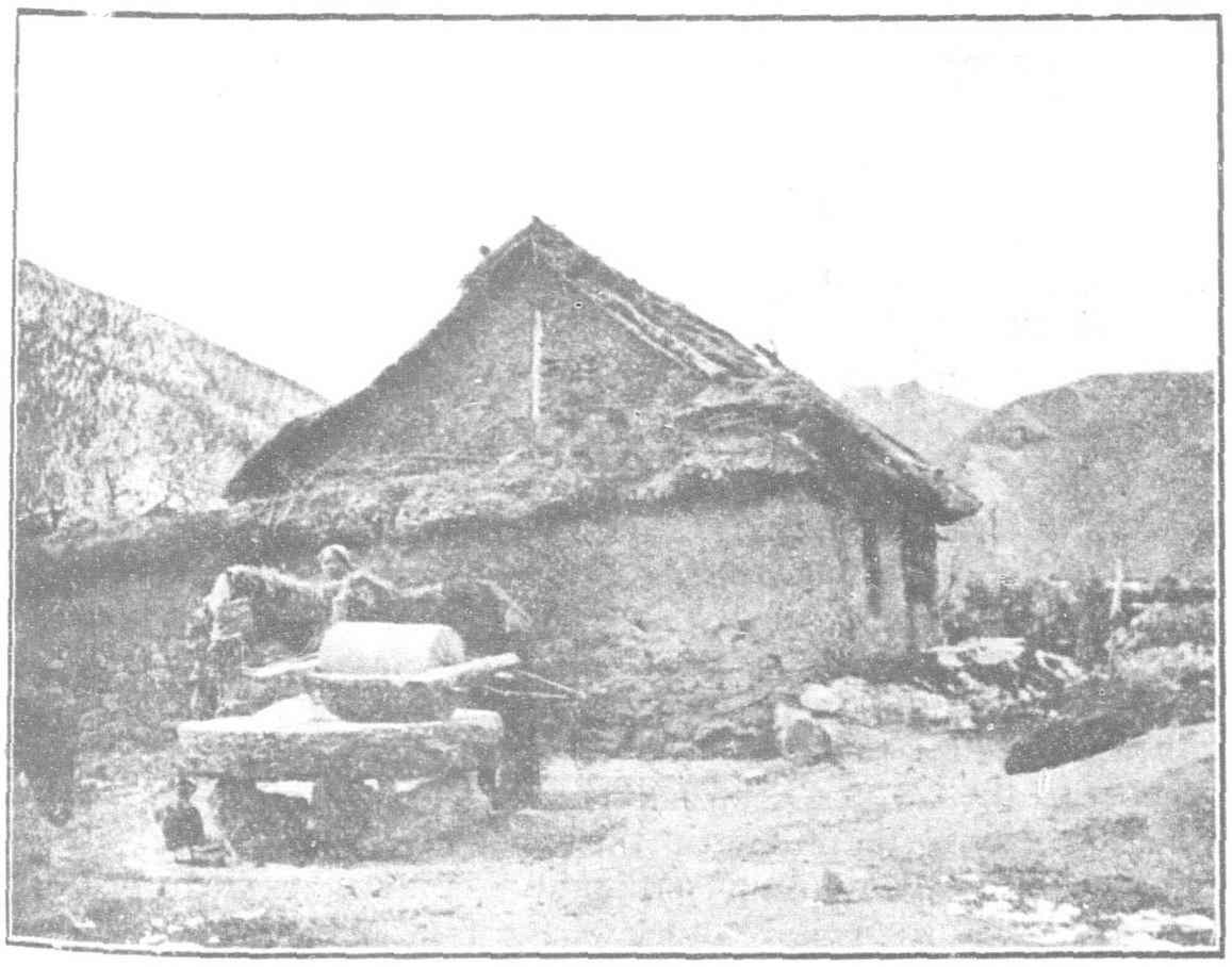


IRRIGATING BY LIFT PUMP, USING PADDLES ON ENDLESS CHAIN ATTACHED TO WOODEN GEAR WHEELS, OPERATED BY BUFFALO, KIANGSU PROVINCE

Hulling Seed in Man Power Mill



Winnowing Seed in Village near Sungkiang, Kiangsu Province



Chinese Grist Mill, Chihli Province

In China enormous quantities of canal mud are applied to the fields, sometimes at the rate of even seventy and more tons per acre. So, too, where there are no canals, both soil and subsoil are carried into the villages and there between the intervals when needed they are, at the expense of great labor, later composted with organic refuse and afterwards dried and pulverised before being carried back and used in the fields as home made fertilizers. Manure of all kinds, human and animal, is religiously saved and applied to the fields in a manner which secures an efficiency far above our own practices.

Crop Rotation Ancient Practice

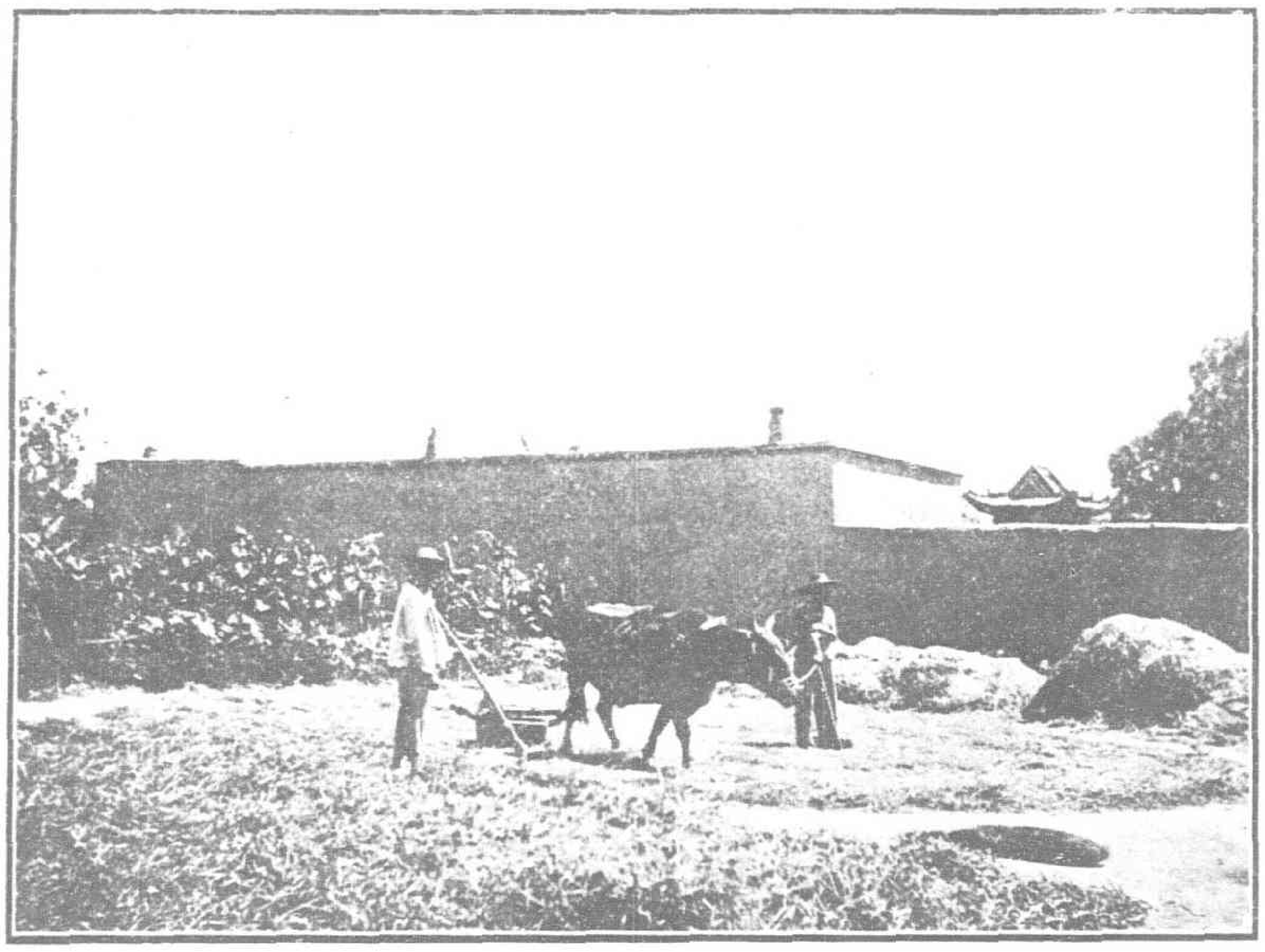
Legumes are grown in rotation with other crops very extensively for the express purpose of fertilizing the soil, and this is one of their old fixed practices. Just before, or immediately after the rice crop is harvested, fields are often sowed to "clover" (*Astragalus sinicus*) which is allowed to grow until near the next transplanting time when it is either turned under directly or more often stacked along the canals and saturated while doing so with soft mud dipped from the bottom of the canal. After fermenting twenty or thirty days it is applied to the fields. And so it is literally true that these old world farmers, whom we regard as ignorant, perhaps because they do not ride sulky ploughs as we do, have long included legumes in their crop rotation, regarding them as indispensable.

The foreigner accuses the Chinese of being always long on time, never in a fret, never in a hurry. This is quite true and made possible for the reason that they are a people who definitely set their faces toward the future and lead time by the forelock. They have long realised that much time is required to transform organic matter into forms available for plant food and although they are the heaviest users in the world, the largest portion of this organic matter is predigested with soil or subsoil before it is applied to their fields, and at an enormous cost of human time and labor, but it practically lengthens their growing season and enables them to adopt a system of multiple cropping which would not otherwise be possible. By planting in hills and rows with inter-tillage it is very common to see three crops growing on the same field at the one time but at different stages of maturity, one nearly ready to harvest, one just coming up, and the other at the stage when it is drawing most heavily upon the soil. By such practice, with heavy fertilization, and by supplemental irrigation when needful, the soil is made to do full duty throughout the growing season.

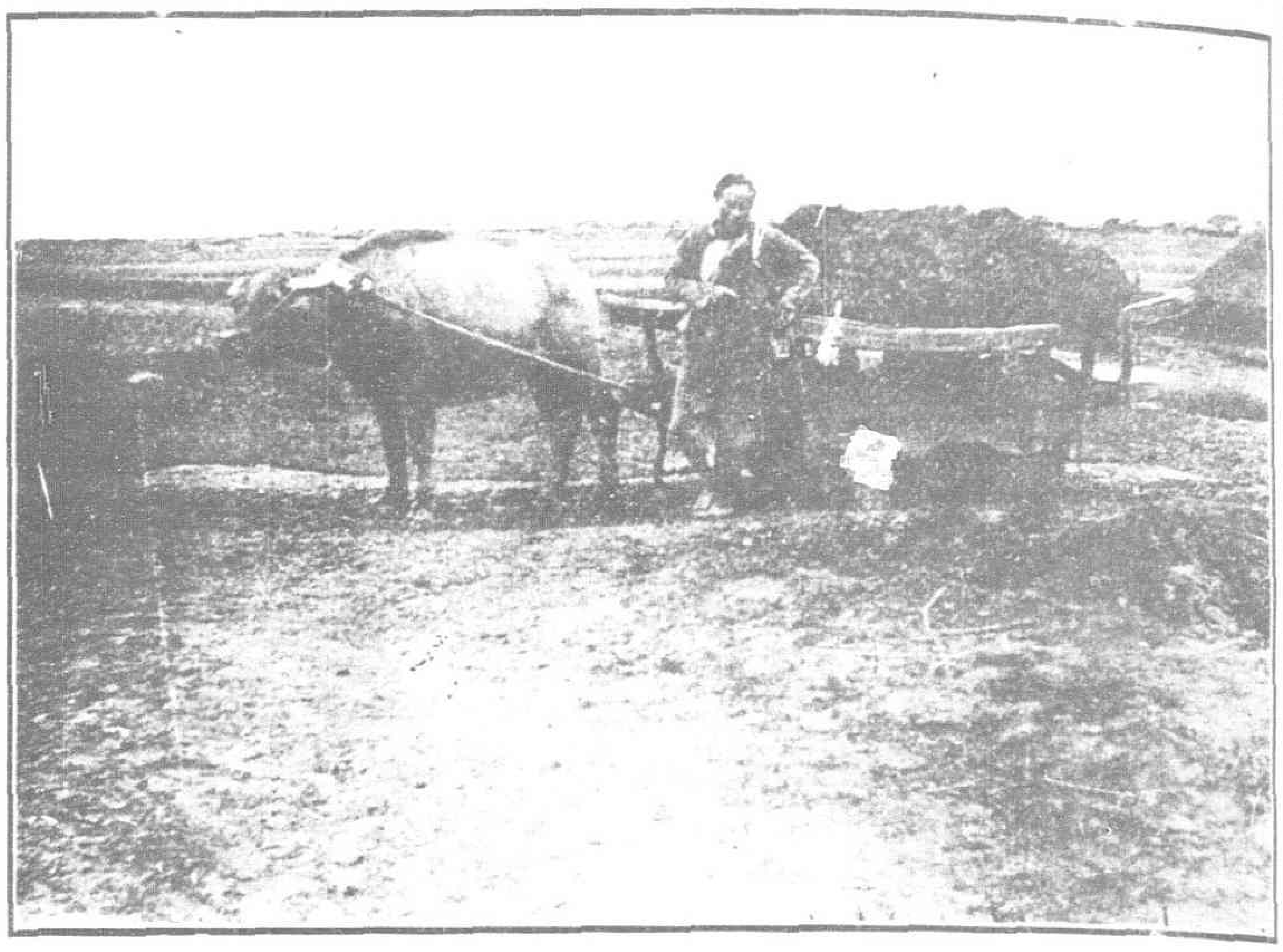
Almost every foot of land is made to contribute material for food, fuel, or fabric. Everything which can be made edible serves as food for man or for domestic animals. Whatever cannot be used or worn is used for fuel. The wastes of the body, of fuel, and of fabric worn beyond other use are taken back to the field; before doing so they are housed against waste from weather, compounded with intelligence and forethought, and patiently labored through one, three, or even six months to bring them into the most efficient form to serve as manure for the soil or as feed for the crops. It seems to be a golden rule with these industrial classes, or if not golden, then an inviolable one, that whenever an extra hour or day of labor can promise even a little larger return, then that shall be given, and neither a rainy day nor the hottest sunshine shall be permitted to cancel the obligation or defer its execution.

Gathering of Statistics

As a matter of general interest, and with the object of showing what China produces in the main, we have decided to publish facts that are available. To acquire statistics in China is a difficult task, though had the Commercial and Industrial Commission organized by the Minister of Commerce, Agriculture and Industry in 1914-15 been sustained, instead of being suspended, facts and figures would now have been available. The idea of that Commission was to make a serious study of Chinese business and industry, and in every way make a thorough investigation of China's products with the purpose of development along modern lines. The Commission was given the very best ability that the Ministry had and there was no check made upon its healthy and normal expansion as a result of financial



Threshing Wheat, Shansi



"Road Roller" Type of Buffalo Cart

embarrassment, for the Minister saw to it that funds necessary to its development should be provided.

The Commission set to work making an exhaustive study of the Province of Chihli, considering that it would be well to limit the extent of its activities in order that a competent organisation might be built up. In other words Chihli was used as an experimental station. Statistics were gathered from every city and village, and compiled in the most improved methods now in vogue in foreign countries. The staff was kept busy, and all seemed anxious to work in earnest. The amount of information gathered within the first ten months concerning Chihli was far in excess of the total information gathered by the Ministry from over the whole of China. All information was kept in a manner that made reference and utilisation simple, whereas in the Ministry no one knew where anything could be found.

The Commission endeavored to come into direct touch with the merchants and native bankers, and were most successful in the attempt. It was a new idea to the Chinese that a Government organ really cared to learn from the people in order that it might in turn render them assistance. Transportation was most thoroughly considered, and freight rates for products from any point in the interior to the nearest coast port were compiled. Unhappily this work went for naught, for when Ku Chung-hsiu became Minister in June, 1916, the Commission was closed. The Government ought to know, however, that unless the Chinese can seriously undertake a thorough study of their own resources there is no hope for the development of China unless it be the direct result of foreign influence that brings pressure to bear and forces China to care for herself. The best thing to be done in the circumstances then is to receive the defunct Commission or appoint competent men to compile the statistics that are so essential to the proper administration of any country, and which are now absent in China.

Chinese chief products and some facts concerning them are here presented:

China's Man Power as Soldiers or Laborers

The views of General J. W. N. Munthe, who has been active in military affairs in China since 1894—when he reorganized the cavalry of North China—on the question of the Chinese as a possible participant in active work at the front.

Upon China's entry into the war, the question has naturally arisen, In what way can she become a useful member of the Entente Powers in their struggle against the Central Powers? As the conception of what China and the Chinese can do differs so vastly, mainly because such conception of both is based on bona-fide ignorance of the subject, it may not be out of place to pay a certain amount of attention to the opinion of foreigners who have had direct dealings with the Chinese during the best part of a life-time. As such opinion is founded upon actual experience and is unbiassed, because it has no personal axe to grind, it may not be uncalled for to put it before our readers, the more so as we all wish and hope that China's entry into the war will become a tangible fact with tangible results, not only to herself but also to her friends whose cause she has espoused.

Therefore General Munthe, who is the only foreigner holding specific rank in the Chinese army and who has enjoyed special opportunities to form judgment on the subject, has been asked for his views, and he says as follows:

China can be most useful to the Allies in the supply of man power. That the quantity is there all the world knows, because every school boy knows that China has about 400,000,000 inhabitants, but when one has said that much one has about exhausted the average foreign opinion as regards the man power of China. The quantity then is given, but what about the quality? The quality—as I shall show presently—is also there, if looked for, and found, and handled in the right way. In order to get a fair and right view of the qualities of the Chinese as a race it is necessary first of all to weed out of our mental garden all the plants which ignorance has sown therein.

The Foreign View of the Chinese

How does Europe, how does America look upon the Chinese? I think if you look into European mentality and seek for an opinion of the Chinese race you will find that it is not a very serious one, nor a very flattering one, but one that the Chinese and their ways constitute something in the shape of *opera comique*. In America public opinion seems to classify all Chinese as laundrymen. That both these opinions are utterly false and unjust I shall presently try to show by comparing the good points of the Chinese—as I have perceived them in my life-long dealings with them—with the negative points, and also by comparing the Chinese as a man and as a citizen with other races of this world, especially those of the East.

What, then, are his good points, mentally and physically? I should say that the most prominent characteristic is his kindness

Only a Slight Demonstration of China's Man Power as Applied to Works of Peace, but just as Potent for Works of War

of heart, which shows itself in all his dealings with his fellow men. By Europeans this sentiment is generally called "face," and is supposed to be an entirely outward manifestation. This conception is no more correct than that the label on the bottle is the contents of the same. The "face" is the label on the bottle, the kindness of heart is the contents. Or perhaps a better similitude would be to say that the "face" is like the face on the watch—visible to the looker-on whereas the temporarily invisible machinery is the active moving spirit. This feeling of kindness of heart, the outcome of true civilization—if we accept the statement that civilization is respect for another man, for his feelings, and for all that in short is his—permeates the whole life of the Chinese, in all classes from the highest to the lowest. Nowhere in the world will you find better manners than in China, and that not only in the better classes, but even among the poorest. The very coolie behaves like a gentleman, but one might very well write a book on this subject because it is really the foundation of the social life of the Chinese. As, however, I am only to touch upon the most salient points in their character in order that the reader may arrive at a more correct and just understanding, I will have to proceed. Next to his kindness of heart I should place his respect for the wisdom contained in books and for the man of letters. As an example of the kindness of heart I may mention his excellent family life, where all the young members of the family are subject to the absolute control of the parents, and where the young ones provide for the parents—as soon as ever they are old enough to do so, and required to do so—and where all that is made by the young ones is brought to and disposed of by the parents as they please, and not as in foreign countries where the reverse is the case. The Chinese family system is the most perfect old age system ever conceived, and requires no support by the Government.

As an example of the respect for learning and the man of letters I may mention the contempt in which the military caste has been held since the days of Chien Lung up to about twenty years ago, when the western spirit of respect for the military commenced to find a standing. It is an old saying in China that you do not use good iron for making nails or a good man for a soldier.

The respect for learning and education has naturally led to respect for authority, and the Chinese people are probably the most law-abiding in the world. They are easily contented, of a happy disposition, and with them enough for the day is the evil thereof.

Physical Qualifications of Chinese

With regard to their physical qualifications they are strong and enduring, rather below the average European in height and weight, leaner of build, not perhaps of extraordinary strength, and probably not so strong as regards direct strength, man to man, as the European, but more lasting. The Chinese may not do his work in the time in which a European would do it, but he

CHINA'S MAN POWER BEING TRAINED IN MILITARY EVOLUTIONS

would work long hours and would not "crack up." In trials of endurance which the writer has instituted for many years he has found that Chinese soldiers of all arms could outmatch any foreign troops of whose marching exercises he had records.

Speaking of physique it would, of course, be interesting to state, as in foreign countries, what the average height, weight, chest measurement, etc. are of the Chinese soldier; but an average height does not exist, because the general who enlists his men as a rule does so from certain districts known to him, and the height of recruits may be totally indifferent to him as long as conditions otherwise suit his purpose. There is in China, as all over the world, the same difference between the men of the north and the south, the former being bigger and heavier than the latter. I have, however, heard lately that army officers do not now care to take men under five and a half feet; the average weight I should not be inclined to put higher than 140 lb.

Having mentioned above a few of the salient points in the Chinese favor let me now in justice to the actual picture also point out the negative points. They may be placed under one heading, I think, and to use the ordinary expression, to which I personally do not subscribe, the verdict would be, "They are such liars and squeezers." They undoubtedly do economise the truth, and they undoubtedly do squeeze, but not to the unlimited extent that the average European is inclined to believe. The fact is that lying and squeezing are institutions in China; I would say they are more in the nature of a national habit than a constitutional vice. I know many will disagree with me and I am willing to admit that lying and squeezing is a vice; and when it becomes so ingrown and so luxuriant as in China, it might be called constitutional, but it is well to bear in mind that no Chinese official has ever had a living wage and that although one hears so much of official corruption which admittedly is rampant, eighty per cent of present Chinese officials die poor. Personally I utterly condemn lying and squeezing, but in foisting these weaknesses upon the Chinese race as the most dominant national characteristics I think an injustice is being done, seeing that the financial system of the country—or rather the absence of it—is at the bottom of the dishonesty.

What the Chinese Laborer Eats

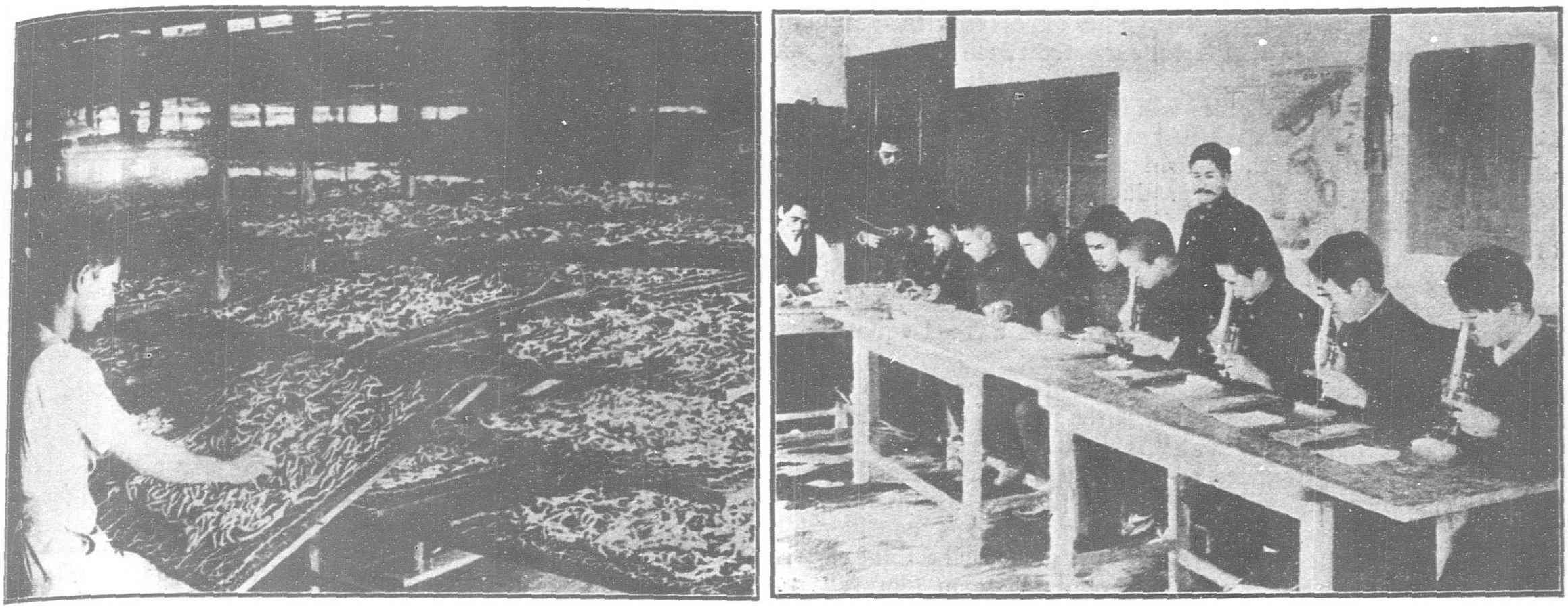
I have no faults to find with the Chinese physically either as a laborer or as a soldier. He will perhaps not overstrain himself in the execution of his allotted work if left to himself, but this is entirely a matter of training, and he will work as well as any foreigner, and longer hours, if kept to it. The Chinese as a nation are vegetarians and this may account for the lean build, physical endurance, and even temper. The staple food for the whole nation consists of rice when and where there is no famine in the land, in which circumstances inferior things, or anything in fact, may be eaten. The meal for the bulk of the population consists of rice, soup made out of any suitable vegetable, such as cabbage, turnips and any kind of melon, etc., but not of fruits which presumably are rarer and more expensive; a kind of bread in the shape of over-sized doughnuts made of maize or more rarely of wheat or corn is universal. Salt is introduced into the system by eating small quantities of salted cabbage or turnip with their food. Bread is almost entirely absent from the ordinary field laborer's table and he does not indulge in this luxury more than perhaps six or eight times per year, that is, at the great festivals, and at weddings and burials—all three being occasions for a good "tuck in." The price of food differs in the different localities. In the rice-producing districts of the south, rice, being the staple food, is of course cheaper than in the non-producing districts of the north, where also bad communications add to the cost of consumption. The average cost of food for a farm hand per month would probably work out at $2 Mex. In the army the soldier is allowed 75 catties of rice per month—a catty being one and a third pound English weight. He then gets two pounds of rice per day. The cost of feeding the soldiers and similar forces ranges from $2 to $4.50 per month. The difference may partly be with the locality, partly with the honesty of the commanding officer and his underlings.

The Adaptability of the Chinese

The Chinese has two points in his favor, both of which are of considerable value: he has no nerves, and an excellent eyesight. He is exceedingly adaptable, more so than any other national. I think this is daily seen in the returned students. It takes but a glance to see and a few words to hear where they have been educated, so thoroughly have they adapted themselves to, and adopted the views and manners of, the country in which they have been schooled. Per contra: a Japanese be he educated in whatever foreign country never ceases to be and to show that he is a Japanese. The explanation is found in the entirely different mentalities of the two nations. The Chinese is individual almost to an excessive degree, hence his clannishness. The Japanese is collective, hence his patriotism. To draw any further comparison is beyond the scope of this article but in order that a foreign reader may get a true conception of the Chinese as a man, a soldier and a laborer, I may mention and what I say is founded on actual experience, that man to man, intellectually as well as physically, the Chinese is by no means inferior to the Japanese—rather the reverse. The reason that it appears differently to the average reader lies in the fact above stated: the Chinese is too individual, the Japanese too (for China) collective. The Chinese stands alone, the Japanese stands for and with Japan. He has all Japan behind him and he knows it, and so does the Chinese individual, and he goes to the wall, till some day he also will become collected and collective.

An individual has never a show or a chance against a machine—and a patriotic, hard, self-centred human machine like the Japanese is a terrific thing to encounter or oppose. It simply cannot be done, at least not for the individualized Chinese. It is only by comparisons that we can arrive at an understandable conception of things, hence the necessity of drawing the above small picture of actual facts—the real picture may in due course of time cover the map and the face of the world; it is but a matter of time.

Let us in the meantime hark back to where we began: The usefulness of the Chinese to the Entente in the present war. We agreed at the outset that the quantity was there, and I have tried to show that the quality is also there. Given quantity and quality, for what purpose can he be used? He may be used as a laborer in any capacity or department because as I have already



Japanese Applying Science to Breeding of Silk Moths to Secure Healthy Ones for Next Year's Crop, an Object Lesson to Chinese Silk Growers

pointed out, he is exceedingly adaptable and intelligent and of good enduring physique, and he can be used direct as a soldier for he has all the qualifications necessary, and even more, in his good eyesight and in the absence of nerves. In whatever capacity he is employed, however, I would like to give his employer a few words of advice, founded upon a life-long experience: Treat him kindly and justly, and you can ask him to perform any work, and he will do it well and willingly. You can work him overtime if you like, if the circumstances demand it, and he will never object, grouch, or growl, as long as you work with him. He is the easiest man to handle if you know how to handle him, and you will be surprised at the work he will do for you. Your motto should be at all times: Kindness and justice.

Silk Production of China

Important comments on the China silk trade were made by Mr. F. E. Taylor in his report on the Foreign Trade of China for 1916, published in the June issue of the Far Eastern Review, while in our last issue we published an excellent article by Mr. D. E. Douty (whose name we then inadvertently misspelled), an expert on the subject, outlining for the benefit of the Chinese the changes which would lead to the improvement of the silk industry in China and to the extension of her commerce in raw silk with other countries. Mr. Douty then made the statement that there seems to be no single natural obstacle to prevent China from competing for her portion of the raw silk markets, and now that there should be an earnest desire on the part of the Government to take advantage of the great spirit of reorganization which the war has developed throughout the world it will be surprising if something is not done to enable China silk once again to take its old place in the trade.

Mr. Douty confined his attention in the article mentioned to consideration of what might be done to improve the industry. We may now outline as a matter of general interest the characteristics of the industry as it at present obtains. In this connexion we are able to quote from an informative article written by Mr. P. R. Josselyn while Vice-Consul at the American Consulate-General at Canton this year.

The consumption of raw silk in the United States, he says, has increased during the past twenty-five years from about five million pounds in 1892 to approximately thirty-one million pounds in 1916, while during the same time the total world production increased from about thirty-three million to fifty-five million pounds.

In 1892 China produced for export twelve million pounds; Europe eleven million, and Japan about six million.

Scenes in Silk Training School of Korea where Women are Given Instruction in Reeling (on left) and Spinning of Thread

Figures for 1916 show that China exported fifteen million, Europe nine million, while Japan exported twenty-eight and one half million.

A glance at these figures will indicate that during the past twenty-five years the United States has become the greatest silk consuming country in the world and Japan the greatest silk producing country, while the production in China has remained almost stationary, increasing only by some three million pounds in twenty-five years.

The total export from China in 1916 is given in the Custom returns at 122,243 piculs valued at Haikwan Taels 78,272,159. A picul is the equivalent of 133⅓ lb., and a Tael equalled in 1916 $0.79 gold, or 3s3 $^{13}/_{16}$ d.

There are two chief exporting centers for silk in China, Shanghai, and Canton. Shanghai is the port of export not only for the steam filature silk which is produced in the vicinity of Shanghai in the provinces of Kiangsu and Chekiang, but in addition quantities of silk are brought in from the districts of west, north and central China. There is also a considerable quantity of wild silk exported from that port. The total export from Shanghai for the year 1915, including steam filatures, re-reeled, and wild silks amounted to 94,000 bales.

The Rearing of Silk Worms

The silk exported from Canton on the other hand is produced almost wholly in the province of Kwangtung. The most important silk district in the province is the district of Shun Tak, although silk is produced in several of the neighboring districts as well. Shun Tak is distant from Canton some thirty miles. Here within an area of about 250 square miles there are about 180 filatures, each employing from 300 to 500 girls.

The growing of the mulberry and the rearing of the silk worms forms the chief industry of that district. The mulberry trees or bushes are usually grown along the banks of streams, and put forth leaves several times during the year. As soon as the leaves mature they are stripped off by the Chinese and fed to the worms. For the benefit of the young worms the leaves are sometimes cut or chopped.

There are six or seven crops of silk produced each year and any flood or other disaster which causes a shortage of the mulberry crop is immediately followed by a shortage of cocoons and a consequent shortage of the silk crop.

The silk worms are reared on large circular trays of woven, split bamboo, and they spin their cocoons on a nesting tray made of twisted bamboo bent into loops about 4 in. high. After the worm has eaten his fill of the mulberry he becomes restless and seeks a place where he may spin his cocoon. It is at this time that the worm is placed on the nesting tray and begins to spin. It requires several days for the worm to complete the cocoon. After the cocoons are completed they are gathered and brought to the market or filature.

Nevertheless, there is not the same attention paid to the rearing of the silk worm as is paid in sericultural districts of Europe and Japan. In the latter countries the eggs and parent moth are subjected to a microscopic examination and no diseased worm is allowed to spin a cocoon. In the Canton silk districts, on the contrary, the methods employed are very haphazard. The infection of healthy worms by diseased worms is very great. The practice of inbreeding, by which the moths of the first crop produce the eggs for the third, those of the second crop produce the eggs for the fourth, etc., has led to a deterioration in the quality of the cocoons as well as to a reduction in the possible production. The advent of the steam filature is said also to have caused a deterioration in the quality of the cocoon. In former times the farmer raised the worms and reeled the silk himself, and it was to his interest to minimize disease and to allow the worm its full time to spin the cocoon. Now the farmer sells his cocoons either at the cocoon market or direct to the filature according to weight (after a certain examination by the buyer), and his energy is turned to production of quantity rather than quality of cocoon.

The Cocoon Market

The best cocoons in the Canton district are stated to come from Yung Kee, and not only are large quantities used in the seven filatures located in that city, but they are shipped to other filatures as well. Yung Kee is a large market town in the Shun Tak district, some four hours by motor boat from Canton. It is a very busy center of trade, not only in cocoons but in other lines as well, as is evidenced by the large number of junks, steam launches and passage boats that line the river front.

SCENES IN REELING ROOM OF MODERN

There are two cocoon markets located at Yung Kee. These are large shed-like affairs, on the river bank, divided off by partitions a few feet high into a number of small bins for the receiving of cocoons. The cocoons are brought in from the surrounding country usually in the early morning. During the cocoon-buying season, passage boats, junks and small native dug-outs bring in a continuous stream of cocoons contained in matting bales. In the early morning and throughout the forenoon the market presents a scene of very great activity, but by noon the cocoons are all brought in, and in the afternoon the market is practically deserted.

As each bale is brought in it is inspected, and if the cocoons are satisfactory, it is weighed and the seller given a red slip of paper on which is stated the weight of the bale, by whom bought and the price. This slip is presented at the cashier's window and the money is paid over in Chinese 20-cent pieces. As there are no banks at Yung Kee this money is brought down daily from Canton by motor boat. Sometimes during the height of the cocoon-buying season over $100,000 in small coin is brought from Canton in a single shipment. As the entire district in and around Yung Kee is infested by pirates, these boats are heavily armed, and in addition the silk people are said to pay a heavy monthly tribute to the pirates as a double precaution against robbery.

As stated above there are two cocoon markets at Yung Kee, one of which is controlled by the local filatures, and the other by a company of silk brokers who sell their cocoons either locally or at any other place where they can find a market. At the time the writer visited Yung Kee there was practically no business being done at the filature market, while the other market presented a very lively appearance. The reason given was that the filatures considered the prevailing price of cocoons too high and were holding off hoping for a drop in the market; on the other hand, the company of brokers were buying in considerable quantities in the hope of getting control of the market and forcing the filatures to buy from them.

How Raw Silk is Bought

The way in which the cocoons are tested when bought is interesting, and illustrates the care that is taken to arrive at the true value of the purchase. Four taels weight of cocoons (N.B. 1 tael or Chinese ounce is equal to 1-⅓ ounces avoirdupois) is selected at random from the lot to be purchased. The buyer sorts these very carefully into four piles, placing an equal number of the large and small cocoons in each pile so that each pile is a fair average of the whole. He then allows the seller to select any one of these four piles, intimating that he is willing to buy on the basis of any one of these samples. After the seller has made his selection the buyer again divides this pile into five equal

CHINESE OWNED SILK FILATURE

parts, taking great care as before to make each part equal. These last piles contain about twenty cocoons each. The seller is then at liberty to select any one of these piles, which is the final sample on which the test is made. These twenty cocoons are weighed, after which they are cut open, the worms taken out and weighed, and the cocoons dried over a fire to drive out any moisture, after which they are again weighed. In this way the net weight of the silk in the cocoons is arrived at, exclusive of the weight of the worm. One catty of cocoons is selected and reeled, and the silk from this sample, together with the amount of waste silk obtained, is also weighed.

The amount of cocoons necessary to reel one picul of silk varies with the season. As a usual thing it is stated to take about five piculs cocoons of the first, second and third crops to reel one picul of silk, while the fourth, fifth, and sixth crops of cocoons will usually require somewhat less, the proportion of cocoons to silk being 4½ or even 4 to 1. At the proportion of 4 to 1 there is obtained the following from 4 piculs cocoons: 1.00 picul raw silk; 0.80 waste silk; 2.20 chrysalis and inside of cocoon.

At the proportion of 5 to 1 a slightly larger quantity of waste silk is obtained. The waste silk is that part which is obtained from the outer portion of the cocoon before the silk is reeled.

As soon as the cocoons are bought they are placed in large bins under which small fires are kept burning. This dries them thoroughly and also kills the worms, otherwise they would pierce the cocoon and escape, which would render the cocoon useless for reeling purposes.

The filatures, of which there are seven at Yung Kee, employ all the way from 300 to 500 girls each. These girls receive very good wages as compared with other female labor in China, the girls employed in the best filatures earning fifty to sixty cents per day, although the scale of pay varies with the season. The average of pay of all the filatures is lower, being from twenty-five to thirty-five cents. The hours of labor in the filatures vary according to the season, but are usually about ten hours per day. The machinery used in the filatures is very crude and is made locally. The steam engines are usually made by Chinese machine shops in Canton.

The cocoons are placed in basins of warm water, which are kept heated by charcoal braziers burning under them. The threads are run from these basins to the reels up above and behind the girl. Two reels are kept going by each girl and it takes one day for the girl to complete the reeling of the two skeins. Seven to nine cocoons are required to make one thread, depending on the size of the cocoon. As there are two threads being reeled from each basin, it is necessary for the operative to see that each thread is supplied with the proper number of cocoons, otherwise the thread will not be uniformly even.

Primitive Filatures

As stated above the machinery in use is very far from being up-to-date. The system of belting is in many instances of the crudest kind imaginable. Then, too, with charcoal fires under each basin, it is practically impossible to keep the water at an even temperature of 160° F., which is required in order to attain the best results. The manner of forming the skeins is also antiquated. They are reeled with a very slow traverse, which produces a very small amount of crossing of the threads. If the silk were reeled with a longer twist of the thread upon itself this would automatically remove slugs and waste and make the silk cleaner and stronger. In addition, heavy, hard-twisted cotton yarn is used for lacing the skeins. It is tied around the skeins, instead of being threaded through them, and the ends of the lacings outside of the knot are unnecessarily long. The size of the lacing makes it slow and difficult to remove from the skeins and the hard twist causes it to curl and become tangled in the silk after it is soaked with the silk in the emulsion of soap and oil. The Silk Association of America has suggested the use of a soft twisted, long staple cotton yarn for lacing and that the lacing be carefully done, putting in four to each skein.

Much of Canton silk contains hard narrow gum spots where the thread rests on the reel bar. The skeins are from 10 to 18 in. longer than the standard skeins of Italy, France, Japan or the American standard raw silk skein and are often about twice as heavy, thus requiring larger swifts or reels, more mill space and a slower winding speed upon arrival in the United States. All these defects in reeling and in skein formation could be very easily and inexpensively remedied. In spite of its defects, however, Canton silk has a peculiar quality owing to its spongy and soft nature which enables the fiber to take up a greater proportion of dye than other sorts and to retain a high luster.

A bale of Canton silk weighs eighty catties or 106⅔ pounds and consists of ten bundles or "books" containing a certain number of skeins, depending on the fineness of the thread, and the size of the skein. The new season for silk starts at the beginning of May, when the first crop of cocoons is ready for market. There are six or seven crops coming on in October or November. There are a number of qualities, ranging from "Superior A" to "Extra B". The fineness or size ranges from 11/13 to 22/26 derniers. The principal markets abroad for Canton silk aside from the American market are Lyons and London.

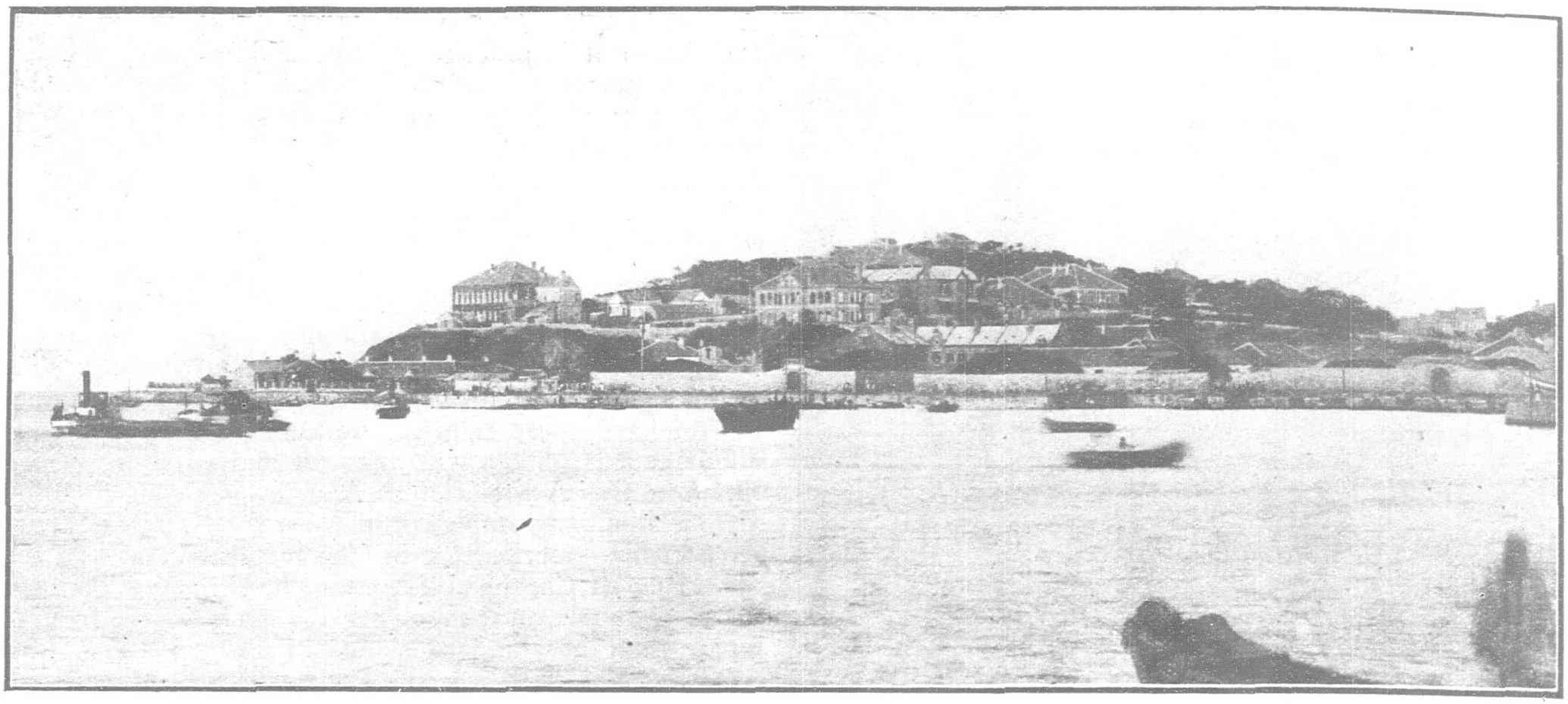
The exports of silk from Canton during the years 1904, 1913 and 1916, as compiled from the statistics of the Chinese Maritime Customs, are given below:

1904	*Quantity*		*Value*
Raw, white,	388,666	lbs.	$945,444
Raw, steam filature	4,602,800	,,	12,631,072
Cocoons, whole	314,534	,,	168,877
Cocoons, pierced	147,333	,,	36,316
Waste silk	4,308,933	,,	969,131
1913	*Quantity*		*Value*
Raw, white,	211,600	lbs.	$ 554,871
Raw, steam filature	6,057,200	,,	20,094,785
Cocoons, whole	824,533	,,	239,139
Cocoons, pierced	275,066	,,	97,871
Waste silk	5,284,000	,,	1,979,193
1916	*Quantity*		*Value*
Raw, white,	377,332	lbs.	$937,741
Raw, steam filature	4,852,800	,,	24,699,298
Cocoons, whole	138,266	,,	122,176
Cocoons, pierced	529,866	,,	307,251
Waste silk	2,975,533	,,	1,980,835

The proportion of raw silk exported to the amount spun and woven locally can only be very roughly estimated, but there is undoubtedly a very large amount used locally, and the spinning and weaving of native silks forms a considerable industry in and about Canton.

Shanghai's Silk Trade

The Shanghai raw-silk season covers the period from June 1 to May 31. The current season has been disappointing. Underfed silkworms and shortage of mulberry leaves due to unfavorable weather conditions in the spring and early summer of 1916 are the main causes of the small production and the unusually poor quality of the silk.



Chefoo City, Center of the Pongee Silk Export Trade

Few scientific methods are used in the cultivation of mulberry trees and the rearing of silkworms in China. The Foreign Raw Silk Association, together with the Chinese Silk Guild of Shanghai, is said to have started a movement to assist the farmers and reelers. The greater interest in the market shown by America should have a stimulating effect upon the industry.

Prices throughout this season have been advanced and at times were almost prohibitive, owing to exceptionally high rates of exchange. Competition among foreign buyers in China is very keen.

The statistics show great irregularity and relatively slow progress during recent years, exports from Shanghai, in bales of 136 pounds, having been as follows:

Season	To United States	To other countries.	Total.
	Bales.	*Bales.*	*Bales.*
1908-9	23,300	76,300	99,600
1909-10	24,000	67,300	91,300
1910-11	21,800	68,900	90,700
1911-12	23,600	82,300	105,900
1912-13	29,700	91,900	111,600
1913-14	29,600	70,600	100,200
1914-15	22,900	46,400	69,300
1915-16	43,800	47,900	91,700
1916-17	*48,600	*18,400	*67,000

*Estimated

The foregoing figures include white and yellow steam filatures, white and yellow native reeled, and tussahs.

Silk Exports from Shanghai

The following table, compiled from unpublished Chinese customs records, shows the quantity of raw silks exported to foreign countries during the past three years, with an estimate of the percentage taken by each country in 1916:

Class	1914	1915	1916	Per cent exported in 1916 to—
Raw:	*Pounds.*	*Pounds.*	*Pounds.*	
White	688,527	723,080	636,400	France, 41; India, 22½; Turkey, Persia, etc., 13; Great Britain, 12; Italy, 5.
Yellow	1,793,164	1,562,105	1,627,600	India, 71; Turkey, Persia, etc., 15; France, 9; Russia, 3½.
Rereeled	1,178,963	2,787,360	2,061,467	United States, 60; Great Britain, 11½; France, 21; India, 4½.
Steam filature	3,176,833	4,898,183	4,352,800	France, 49; United States, 46.
Raw, wild	1,811,689	3,173,948	1,452,533	United States, 79; Japan, 15; Great Britain, 2½; France, 2.
Cocoons	2,757,417	4,224,830	3,243,067	Japan, 55: United States, 16; Italy, 14; France, 13.
Waste	7,019,417	12,499,800	14,176,933	France, 33; Italy, 30; Turkey, Persia, etc., 18; United States, 14.
Cocoons, refuse	1,682,840	5,544,760	5,587,367	Italy, 50½; France, 46.
Total	20,108,850	35,414,066	33,138,267	

Exports of silk pongees increased in United States currency by $496,450, but expressed in the local medium they decreased by more than 1,000,000 Haikwan taels.

Silk piece goods of all kinds decreased in quantity nearly 100,000 pounds, but their value in United States currency increased by more than $2,000,000. These went chiefly to Hongkong, the Straits Settlements, the Dutch East Indies, Japan, and Chosen (Korea).

Pongee Silk From Chefoo

The declared exports of pongee silk represent but a part of the actual shipment to the United States originating in the Chefoo consular district. The direct shipments, however, are important, and the demand in the United States has greatly increased. There was an increase of 34,166 pounds in the exports of this product to the United States during the three months ended March 31, 1917, compared with the corresponding period in 1916.

The exports of pongee silk, in gum, declared for the United States, increased in value from $144,535 in the first three months of 1916 to $335,418 for the 1917 period and in quantity from 85,957 to 120,123 pounds.

During the early part of this year anxiety was felt on account of the shortage of cocoons, and many qualities of pongee silks disappeared from the market. Despite high exchange the demand from the United States, Australia, France, and Great Britain continued strong, and it was considered only a question of a short time before existing stocks would be depleted and prices advanced to a prohibitive figure. Due to high freights and insurance premiums on account of dangers to navigation caused by the war, prices had reached the prohibitive stage for most shipments to Europe, and this was followed by the prohibition against the importation of pongees into Great Britain, with the result that the market was somewhat eased.

The silk filatures at Chefoo depend upon Manchuria cocoons for their supplies and in addition to a short output during the past season a number of filatures have been established near Antung. Much of the silk produced at these filatures is going to Japan where imitations of the handmade Shantung pongees are being manufactured by machinery. Although the handmade pongees are far superior in wearing qualities to machine-made goods, the light-weight silks made in Japan appear quite satisfactory, and the cost of manufacture is naturally much less. If unfavorable conditions continue both in regard to exchange and freights and in the supply of cocoons to Chefoo, it is reasonable to expect that the light-weight Japanese machine-made pongees will seriously threaten the lower grades of Shantung pongees. In the manufacture of heavy pongees the Japanese machine-made imitations are unsatisfactory.

China's Oil Seeds and Their Products*

Whoever has made the journey from Shanghai to Nanking by rail in the late springtime must hold in memory at least one golden day, for then the train progressed through fields of brightly aureate hue as if some mighty alchemist had transmuted the greensward into yellow metal, or gilded the grass with liquid sunshine. Wild mustard was the verdict of the casual traveller who may have seen the waste hillsides of California blooming with that so-called weed. Rape seed was the correction of the old China hand to whom this annual glorification of the field had become an old story.

Rape seed it was, and although the whole of the Yangtze valley from Shanghai to Szechwan glowed with its gold, yet rape seed is only one of the many oil-bearing plants with which China abounds, and not even the most important, though its flower is quite spectacular. It is with rape and cotton seed that the story of China's oil seeds should start, for if the average occidental eats the proverbial peck of dirt in his lifetime, the average Chinese consumes enough of these oils to drown himself and all his numerous progeny. Vegetable oil is the butter and the lard as well as the salad dressing of the poorer class of Chinese—and in some localities of the better or even the best class as well,—for millions of gallons are produced annually. Though of the total output only a small part find its way into China's export commerce, and the huge remainder quickly disappears down the alimentary canal of most of the four hundred millions of its population, yet the exports of oil seeds and their products are close to 70,000,000 gold dollars a year and rank second only to silk in importance in China's foreign trade.

Rape seed oil is one of the cheapest of China's vegetable oils and is therefore used to adulterate most other oils. It is a certainty that any one wishing to buy one of the more costly oils, such as sesame, will pay more for it at the oil mill where it has just run from the press than at the oil shop in the next block, although it then carries the profit of the middleman and the retailer as well as that of the oil presser. In fact, it is almost impossible to buy the more expensive oils in a pure condition so general is adulteration practiced by the dealers.

During the past six or eight thousand years of the Chinese people's national existence, they have come to the maximum efficiency as regards diet and while they never have heard the word calory applied to foodstuffs, they are just as economical in getting their money's worth in the matter of food as in anything else. It is not, therefore, astonishing to note that the Chinese diet is largely made up of fats, and being denied the more costly animal fats, except that of the humble pig on rare occasions, they instinctively turn to the vegetable oils as giving them the best return for their expenditure. These vegetable fats also have the added merit that they can be grown in sufficient amount to support a family on an area of land that scarcely would bring to maturity one "razorback," let alone a pig of the more fancy foreign variety.

Oils and Seeds Worth $70,000,000

The production of oil seeds and oils therefrom in China is enormous and while the Customs export statistics show that more than 70,000,000 dollars' worth of oil seeds and their products were exported in the past year, there is little doubt that fully five times as much, of the edible oils at least, are consumed in the city or town where it is made and never reaches any Customs station, either foreign or Chinese. No accurate statement of the actual consumption of home-pressed vegetable oils can be given without a census of the oil mills and their annual outturn, and it will be many years before such an enumeration is made. Judging from other countries where statistics are available, India for example, whose people are not much better off in this world's goods than are the Chinese, the consumption of oil seeds is to the exports as ten to one and for every pound exported, the Indian eats nine pounds. The statistics in this case refer to sesamum which is one of the most costly oil seeds grown and if the Indian eats nine tenths of his product surely the Chinese must eat almost as large a percentage of the cheaper oils he produces such as rape and cotton seed. This is amply proved in the case of rape oil by the exports of rape seed cake or residue from the oil press. The exports of this commodity in 1916 were upwards of 31,000 tons, and as the exports of oil in the same period were slightly over 2,000 tons, the ratio of oil to cake being roughly 30 to 70, there remains the difference between the 13,000 tons of oil indicated by the cake output and the amount of oil exported, or 11,000 tons consumed.

Rape Seed, Oil and Cake Statistics

(Oil yield from 30 to 36 per cent)

Rape oil total exports in 1916 were 2,172 tons, value 223,703 dollars or 103 dollars a ton. Value in 1915 was 73 dollars a ton. Exported to Great Britain 767 tons; U. S. A., 474; Japan, 436. Exported from Hankow.

Rape seed total exports, 41,600 tons, value 1,586,000, or 38 dollars a ton. Value in 1915 was 27 dollars. Exported to Japan, 40,000 tons; Great Britain, 244; Hongkong, 344. Exported from Wuhu, Tientsin, Hankow, Shanghai and Hangchow.

Rape seed cake 19,000 tons, value 253,350 exported to Japan.

Cottonseed and Oil Export

In the case of cottonseed, which is the cheapest oil seed in China, probably because of its low oil content, the amount consumed by the Chinese is much greater since cottonseed sells for some 13 dollars a ton and contains 12 per cent available oil, while rape seed this year brought 38 dollars a ton. The inference is that the Chinese native oil miller will be able to buy the cheaper seed much more readily than the dearer, if the cost of shipping both is the same.

Some 82,000 tons of cotton passed through the Customs in 1916 and as cotton "thirds itself at the gin," this would mean more than 160,000 tons of seed. If the seed exported, 25,000 tons, is subtracted, the oil yield from the remainder of 135,000 tons is only 16,000 tons, and the exports of oil were slightly over 7,000, leaving 9,000 tons for home consumption. That the total seed available is much greater than this is apparent from estimates of the total Chinese cotton crop which is placed at some two million bales of 500 pounds each in a report on China's cotton goods trade by Ralph Odell of the United States Department of Commerce, on the authority of a firm of exporters who buy in many Chinese markets. This billion pounds of cotton means two billion pounds of seed or 120,000 tons of oil, against which the exports of 7,000 odd tons are insignificant.

Cottonseed and Oil Statistics.

(Oil yield of seed variously stated at 10 to 13 per cent)

Total exports in 1916 were: Oil, 7,394 short tons, value 668,323 dollars gold or 90 dollars a ton. Value in 1915, 64 dollars. Exported in 1916 as follows: U.S.A., 3,715 tons; Japan, 2,236; Great Britain, 306; France, 131. Originated in China chiefly from Shanghai, Hankow and Ningpo.

Total cottonseed exported, 24,870 tons, value 327,738 dollars gold, or 13 dollars a ton. Value in 1915 was 10.80 dollars. All exported to Japan. Originated in China from Tientsin, Shanghai and Hankow.

Cottonseed cake not separately listed in Customs returns but 36,516 tons of miscellaneous seed cake valued at 642,000 were exported principally to Japan.

The Chinese Oil Miller's Methods and Machines

To those familiar with the elaborate oil mills of Europe and America, a description of the crude yet efficient manner in which the Chinese treat the seed should be of interest. In the case of cotton, rape seed and beans, together with most of the miscellaneous oil seeds, the process resolves itself into grinding by means of an edge runner mill consisting of two millstones set on edge which travel in a circular stone track being pivoted at the center of the beam joining them. The means of propulsion is usually a donkey or buffalo. The seed is fed by hand upon the track and is alternately heaped together and spread by scrapers that are attached to the millstones. The ground seed is then steamed and placed in rings of straw which hold it in place in the press. The press itself deserves more than passing notice because of its simplicity. It consists of two timbers about two feet square and eight to ten feet long set 18 inches to two feet apart, the ends being bolted to blocks of wood so that a rectangular box is formed. The bottom is made of a grill or grating. The straw forms containing the ground and steamed seed are then placed on edge in the press backed by a wooden block of equal size and the remainder of the space is filled with smaller blocks. The middle blocks are half the width

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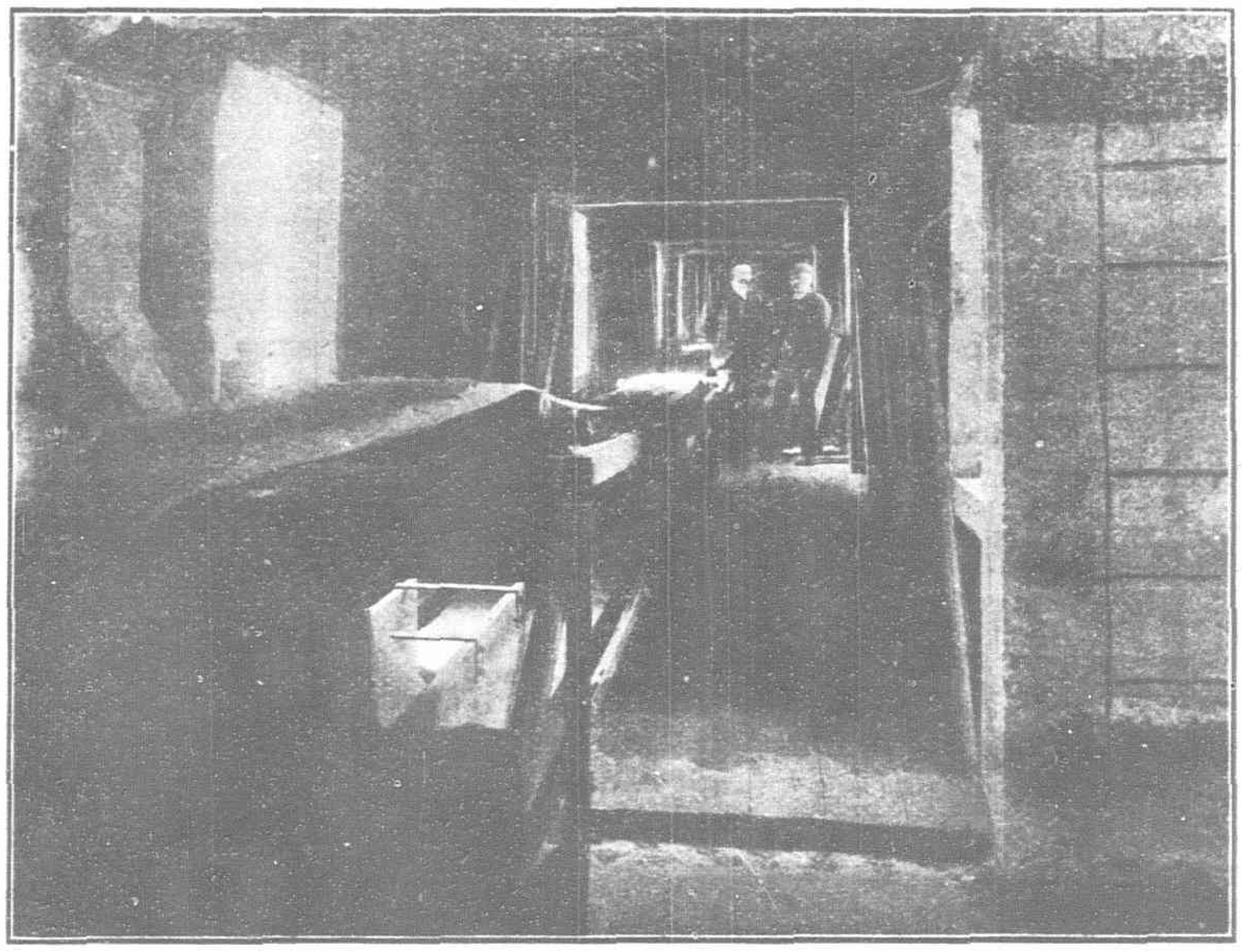
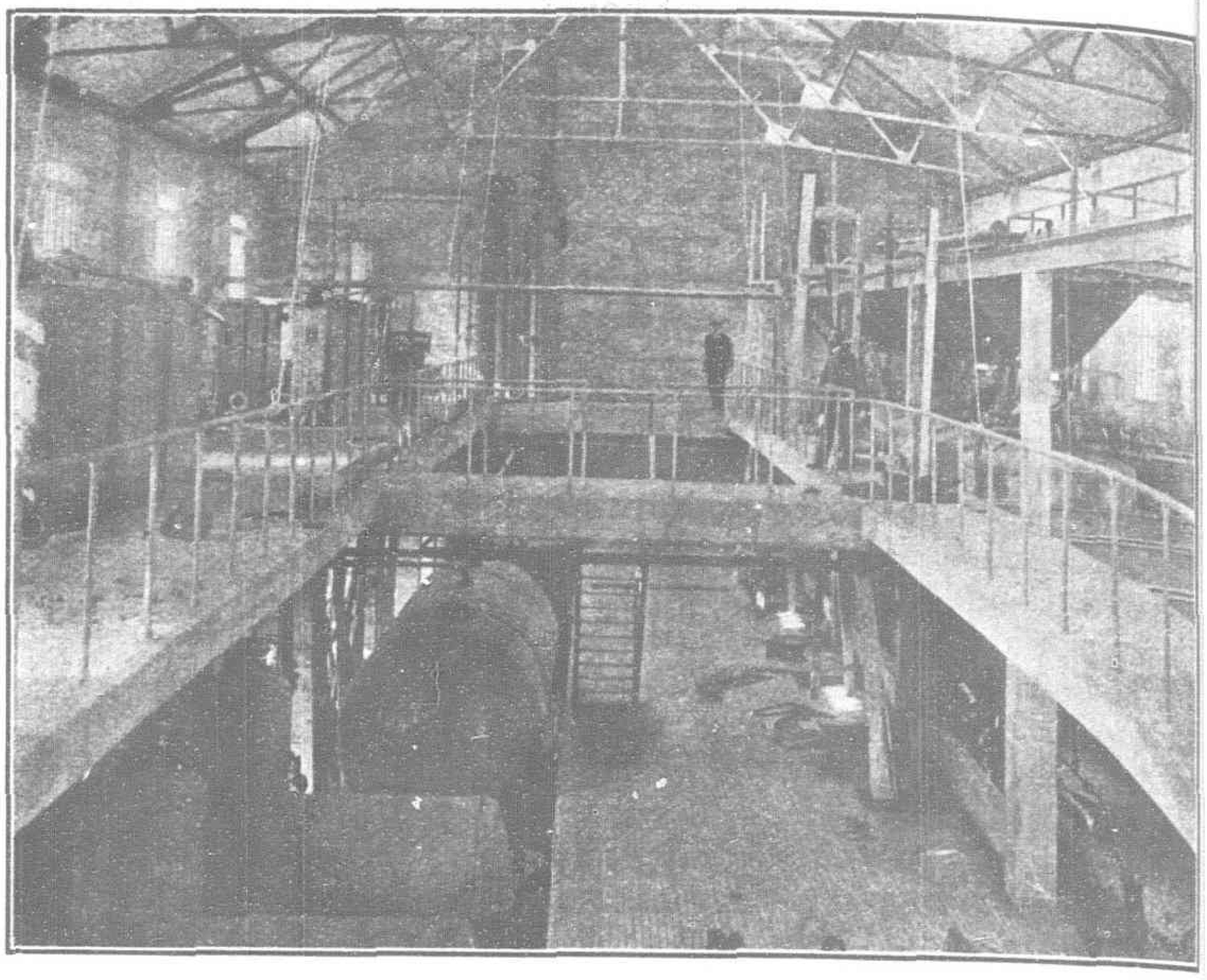
* Values in U. S. Currency—Tons of 2,000 pounds.

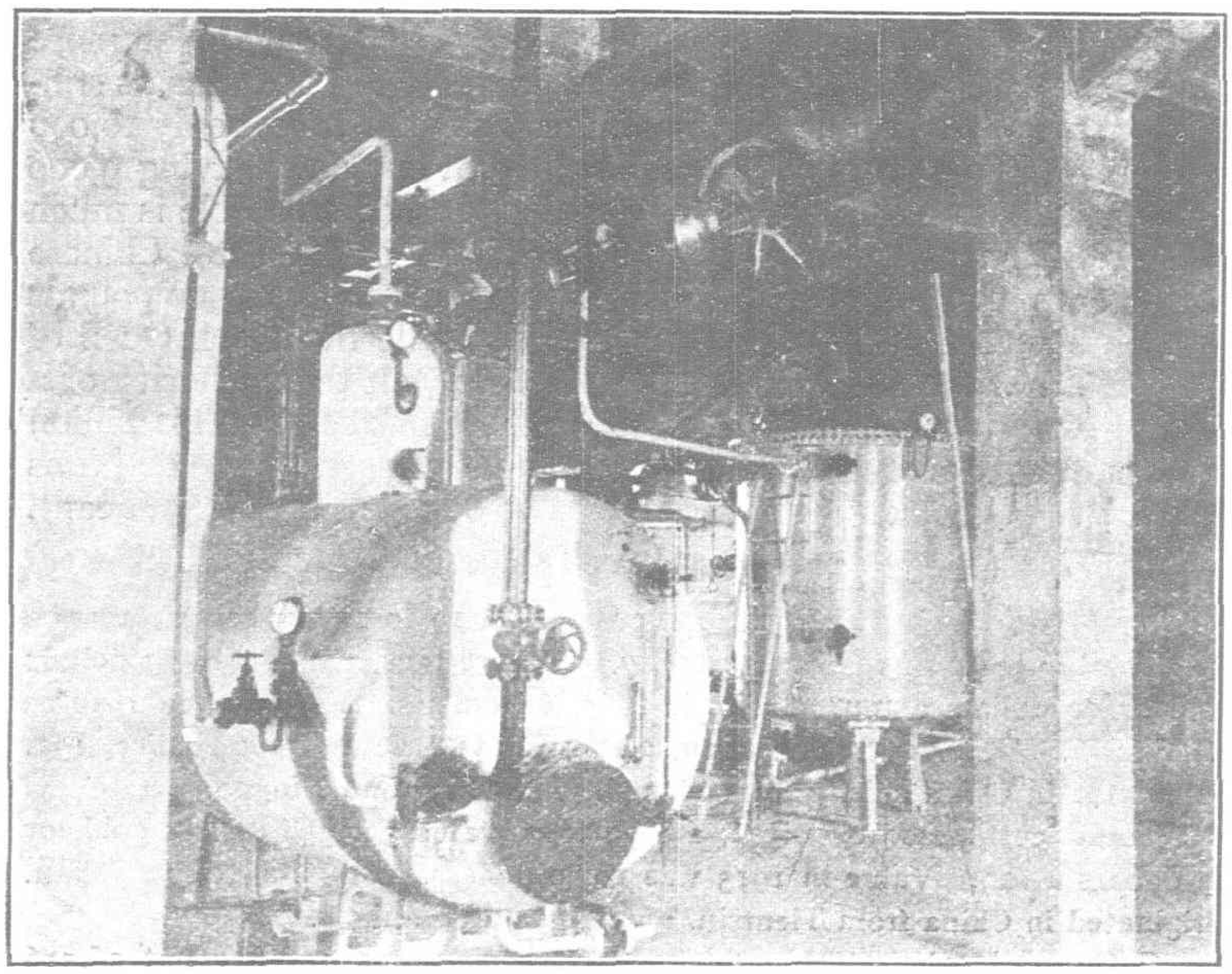
Modern Mill for Crushing Seed and Extracting Oils



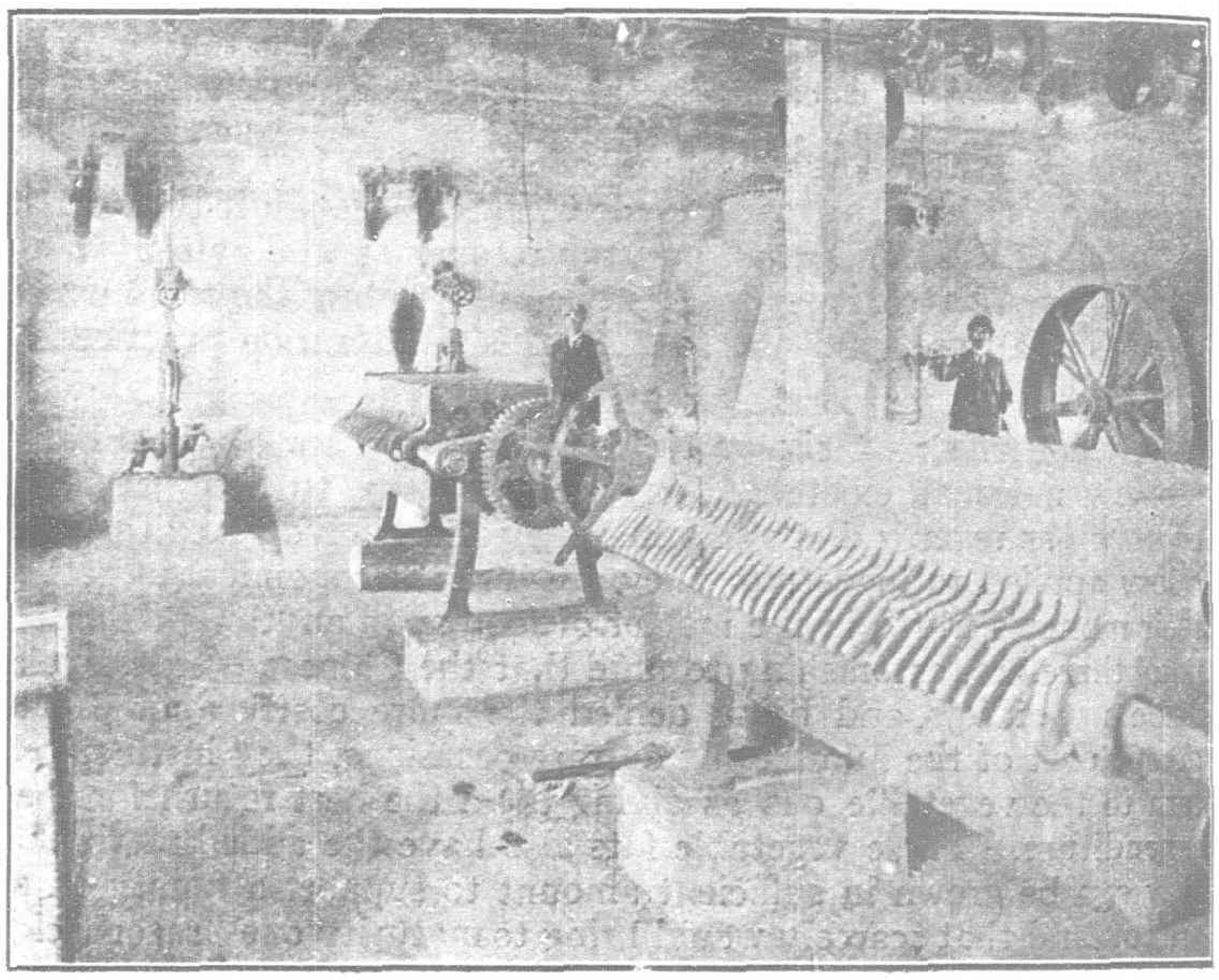
Band Conveyor Taking Beans to Crushing Room



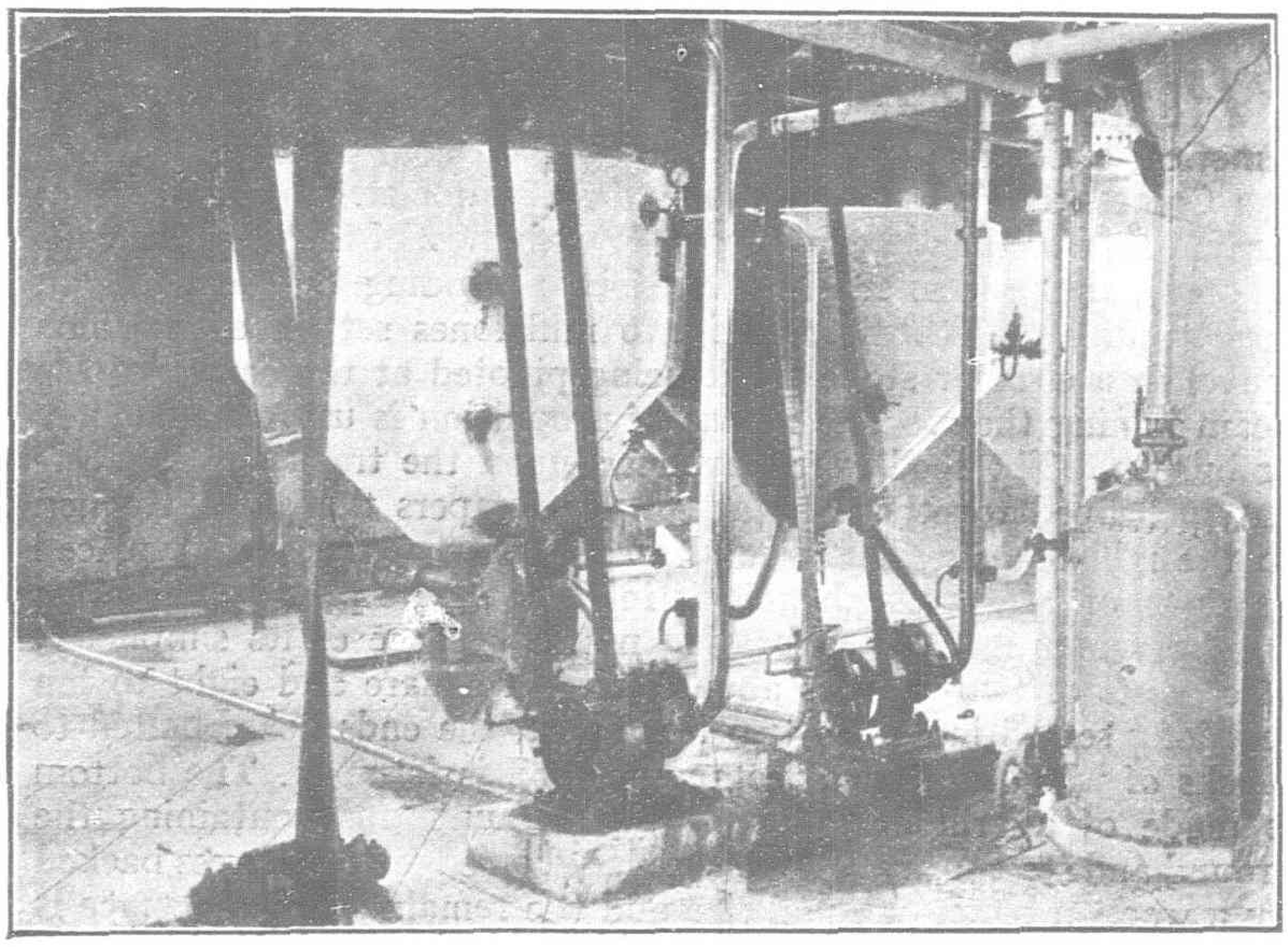
Interior View of Extraction Room



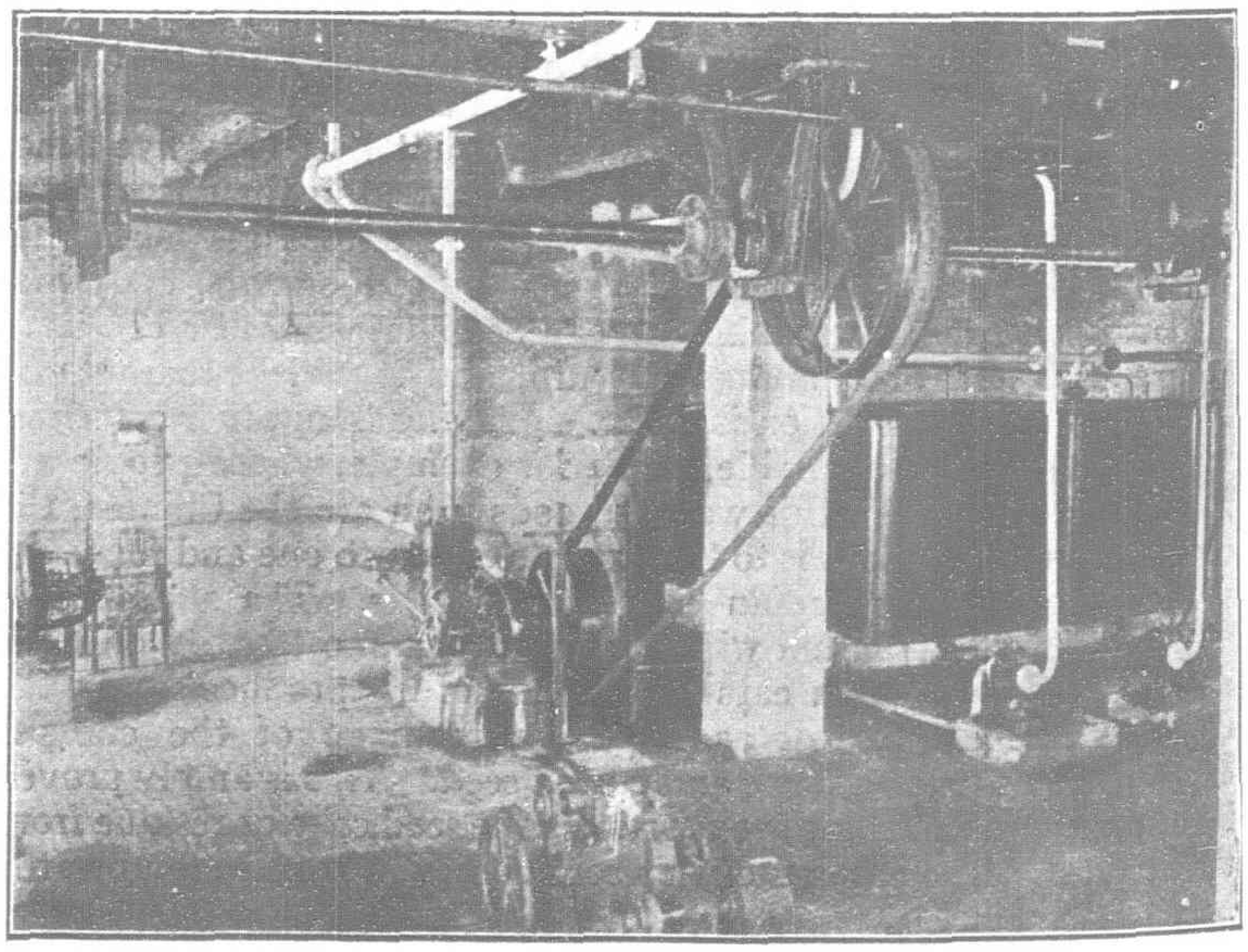
Bleaching Kettle



Filter Presses



Refining Tank and Neutralising Tank



Vacuum Pump and Motor

of the press and on each side are blocks one quarter the width. The workmen then insert three wedges, that in the middle being twice as wide as those at the sides. The center wedge is then driven home and this loosens the blocks on both sides. More side blocks are put in and the side wedges driven in, thus loosening the center wedge. More blocks in the center are put in and its wedge is driven, the effect being alternate compression on sides and center, forcing the thrust block against the rings of seed, the oil meantime dripping down through the grid into a shallow well beneath.

As the only material used is wood, if the staybolts and tips of the wedges are excepted, the Chinese oilpress is a triumph of ingenuity in the use of materials at hand and in the application of the wedge to do work that only the screw press or the hydraulic one can excel. To be sure, the Chinese oil miller does not get the full quota of oil from the seed, but for that matter, neither does the more elaborate and infinitely more costly apparatus of the "westerner." As far as the oil left in the cake is concerned, it is a welcome addition to the diet of the Chinese work animals which subsist the winter long upon it, although the cotton seed cake being pressed from the whole seed, lint and all, is a most unappetising looking fodder.

Sesamum Seed and Oil

The procedure in the case of sesamum seed is quite different and is ably set forth in the masterly report made some years ago by Sir Alexander Hosie on the industries of Szechwan. His description is in part as follows:

> Both the white and black seeded varieties of sesamum are cultivated in Szechwan, the former for the oil extracted from it and the latter in small quantities for medicinal purposes. This is the most expensive edible oil in the province, costing 240 cash a catty to produce, and retailed at 320 each. It is called "Hsiang Yu," or fragrant oil, and is eaten raw mixed with cooked vegetables. The method of manufacture is peculiar. I propose to describe it as I witnessed it. Twenty-five catties of white seed, valued at 2,000 cash, were carefully washed in cold water and spread out to dry. They were afterwards placed in an iron pot and baked till of a light brown colour, when they were taken out and ground between two millstones. The ground seed was then collected and placed in another iron pot, and boiling water sufficient to cover the contents poured in. The whole was then carefully stirred with a rolling-pin till the moisture was all absorbed. Boiling water was poured in and stirred, and absorbed a second and third time, and finally a fourth time, when, the absorptive power of the seed being satisfied, the stuff was in a more or less liquid condition. The workman then took up a whole gourd fitted with a wooden handle, and containing one catty of broad beans to weight it, and gently tapped the contents of the pot till the oil rose to the surface and the solid matter sank to the bottom. The oil was then poured off, and weighed between 10 and 11 catties—that is to say, the yield of oil amounted to between 40 and 50 per cent of the weight of the seed. The refuse is sold for feeding pigs. As a rule, this oil, being very expensive, is highly adulterated with rape oil, which costs only one fourth the price. Contrary to European ideas, the higher and more expensive grades of oil can be purchased cheaper in the retail shops than at the oil mills, for the simple reason that they are adulterated with inferior and cheaper oils, and there is no law or regulations to prevent it. I should have mentioned that sesamum is a summer crop, the seed being harvested in August.

Sesamum Seed, Oil and Cake Statistics for 1916

(Oil yield from 40 to 50 per cent, average 46 per cent)

Sesamum oil exported 2,176 tons, value 254,848 dollars, or 117 dollars a ton. Value in 1915, 82.50 dollars. Exported to Hongkong, 1,255 tons; Japan, 300; Great Britain, 240; Russia, 75. Exported from Chinkiang, Hankow.

Sesamum seed exported 103,873 tons, value 5,528,223 dollars, or 53 dollars a ton. 1915 value, 37 dollars. Exported to Great Britain, 37,000 tons; Italy, 17,740; Japan, 9,725; Hongkong, 742. Exported from Hankow, Chinkiang, Shanghai. Sesamum seed cake exported 556 tons to Japan.

Consumption of Bean Oil

Bean oil is also largely consumed by the Chinese as a foodstuff, but as it is treated in a special article on the soya bean, on page 696 of this issue, only the probable home consumption of the oil will be considered. The total production of bean cake is some 1,250,000 tons, although the exports are only 775,000 tons. Based on a ten per cent yield, the total oil produced would be 138,000 tons of which 104,000 was exported, leaving 34,000 tons as the visible consumption of the oil in China.

Groundnut (Peanut) Oil Exports

Another oil seed which is largely produced is the groundnut, known in America as the "peanut." The trade in this seed was the subject of a report by American Consul General Sammons of Shanghai printed in full in the FAR EASTERN REVIEW for July. The following is a summary of that report:

Chinese peanuts are said to average 46 per cent oil. The oil is expressed and exported in large quantities for use in cooking, as substitute for olive oil, and largely in the manufacture of soap. The value of peanut oil exported in 1915 exceeded by more than fifty per cent the value of all peanuts shipped. After the extraction of the oil the product remaining is formed into cakes, which are used as fodder, poultry feed, or fertilizer. A large part of the peanuts exported to Europe is used in the manufacture of oil and soap.

The greater part of the peanuts of China used commercially come from the provinces of Shantung, Honan, and Chihli. Shantung peanuts are ordinarily larger in size, while those from Honan and Chihli are said to be somewhat richer in oil and consequently usually bring better prices.

Prior to the war, the port of Kiaochow (Tsingtau) held first place among China's ports in exports of both peanuts and peanut oil, shipping, in 1913, 44 per cent of all the peanuts exported and 43 per cent of peanut oil. Since then its trade has been diverted largely to Chefoo, Hankow, and Shanghai.

Customs returns show Tientsin and Chinkiang as the principal export ports for peanuts in the shell. Practically all of these shipments were made, however, to other Chinese ports and Hongkong for transhipment and to Pacific port of Russia. Of peanut kernels, Hankow and Shanghai shipped 75 per cent of the total, the amounts from the two ports being about the same. Those exported from Hankow, however, all went to other Chinese ports, principally to Shanghai, whence they were largely transhipped abroad.

In 1913, the latest year of normal conditions, the Chinese Maritime Customs record a total export abroad of 68,160 tons of peanuts, including both shelled and unshelled. Of these about 35 per cent went to France, 25 per cent to Hongkong, mostly for transhipment to other points, 15 per cent to the Netherlands, and 10 per cent to Germany. Italy, Great Britain, Austria, and Russia received the greater part of the remaining 15 per cent. Only 437 tons were shipped to the United States.

The volume of exports in 1914 was about the same as the year before, destinations differing materially as a result of the war. But in 1915 there was a reduction of more than 50 per cent in exports, the customs returns recording shipments during that year of only 19,773 tons unshelled and 12,862 tons of shelled peanuts, a total of 32,635 tons, against 68,160 tons in 1913. Of the peanuts shipped in 1915, Hongkong received nearly 50 per cent, Russia in Asia coming next with 16 per cent, while Great Britain, France, Japan, and the United States followed in the order named.

Groundnuts, Oil and Cake Statistics for 1916

(Oil yield 40 to 46 per cent from selected seeds)

Groundnut oil exported 37,434 tons, value 4,740,390 dollars, or 125 dollars a ton. 1915 value, 91 dollars. Exported to Japan, 15,000 tons; Hongkong 13,200; Great Britain, 2,500; U.S.A., 600. Exported from Shanghai, Tientsin, Ichang, Nanking, Swatow.

Groundnuts in shell exported 13,790, value 634,747 dollars, or 46 dollars a ton. 1915 value, 31.40. Exported to Hongkong, 5,520 tons; Russia, 3,200; Japan, 555; Great Britain, 504; and U. S. A., 44. Exported from Tientsin, Chinkiang, Chefoo, Shanghai, Swatow, Hankow.

Groundnut kernels exported 28,334 tons, value 1,431,678, or 50 dollars a ton. 1915 value, 42.20 dollars. Exported to Hongkong, 11,100 tons; Japan 11,050; France, 2,590; Great Britain, 1,000; U.S.A., 580. Exported from Hankow, Shanghai, Chefoo, Nanking. Groundnut cake exported 2,562 tons, value 61,271 dollars, or 24 dollars a ton. Exported to Hongkong, 1,400 tons, Japan, 1,000. Exported from Ninnang, Pakhoi, Tientsin, Shanghai.

Other Oil Seeds Exported

Among the other seeds that are largely exported for their oil content is linseed, but this, with Tung oil or "China Wood oil" as it is called in commerce, will not be taken up here, as they fall into a different category from the other vegetable oils, being used in the manufacture of paints and varnishes, but entering into consumption as food.

Another, but little known product that is exported from China for its oil, is the kernel of the apricot. This comes for the most part from the Tientsin district and before the war went largely to Germany. It contains not only a fixed oil, but a volatile oil as well, and is the largest source of oil of bitter almonds. The seeds are treated in chemical works where they are first cold pressed and the fixed or non-volatile oil is that which goes into commerce as oil of almonds. The pressed cake that remains is then ground and soaked in tanks until a chemical change is brought about by a ferment-like body which breaks up the glucoside called amygdalin, and converts it into prussic acid, one of the most active poisons, and benzaldehyde which is the oil of bitter almonds. This oil is volatile with steam, and after purification, to remove every trace of the prussic or hydrocyanic acid, it is sold to perfumers. The oil of bitter almonds from the apricot peach and other kernels is known as "true" oil and brings a much higher price than that made by the oxidation of benzal chloride obtained from coal tar. Nitro-benzol also has an odor similar to that of benzaldehyde and formerly was used as a substitute by perfumers.

Apricot Kernels Export Statistics.

(Almond oil content 30 to 40 per cent)

Apricot kernels exported 2,227 tons, value 435,218 dollars or, 195 dollars a ton. 1915 value, 145 dollars. Exported to Hongkong, 675 tons; France, 661; Great Britain, 295; Japan, 205. Exported from Tientsin, Chefoo, Newchwang.

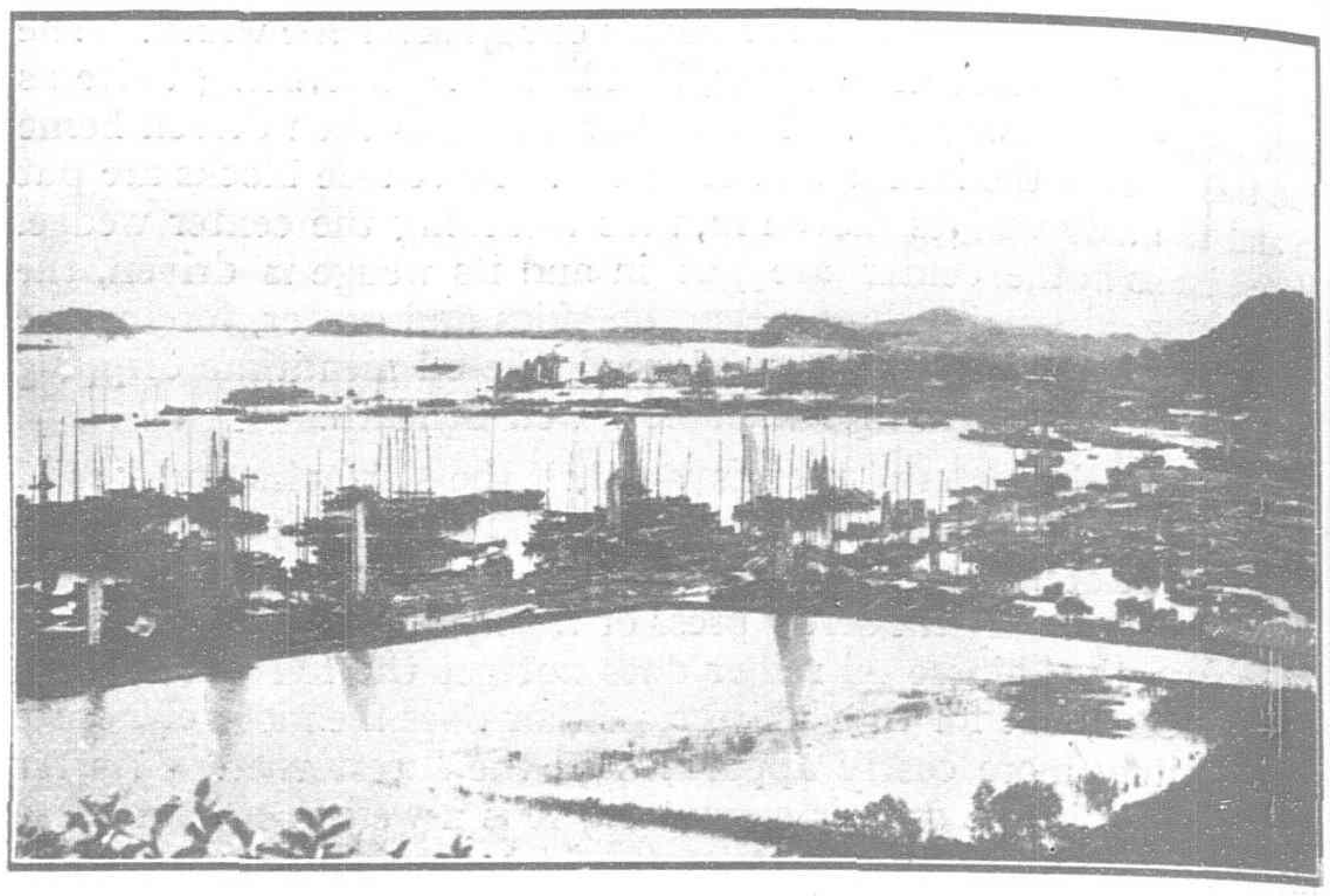
Shifting of Oil Seed Trade Since Outbreak of War

It is not only as food that the oil seeds and their products are important, but all these vegetable oils are principally glycerides of various fatty acids. On saponification, as the various processes for obtaining the fatty acids are generally termed, the glycerine is separated and is available for the manufacture of explosives such as nitroglycerine, dynamite and various mixtures of nitroglycerine with nitrocelluloses, the last named class of compounds entering largely into warfare as smokeless powders. Therefore it was to be expected that not only cotton, which is the base of nitrocellulose, but cottonseed oil as well, being a glycerine-containing substance, should be withheld from the Central Powers. Therefore the vegetable oils were soon placed on the absolute contraband list of every allied country.

Before the war, Germany figured to a large extent in China's oilseed export trade, as she did in that trade with every country producing such materials. Germany's consumption of vegetable oils in 1913 was some 600,000 tons made up principally as follows: Cacao, 24,000; coconut, 97,000; cottonseed, 70,000; groundnut; 19,000; olive, 10,000; palm, 100,000; rape, 37,000; sesame, 46,000; and soya bean, 70,000. All this enormous trade, the 600,000 tons of oils representing double that tonnage of the seeds, is now distributed elsewhere, and some countries whose oil pressing was limited to materials grown in their own boundaries have developed the industry to no mean proportions since August, 1914.

Germany's nearest competitor before the war was France whose imports of oil seeds was some 600,000 tons having an oil content of 40 to 50 per cent of that total, or 240,000 to 300,000 tons of oil. That was about the maximum of Marseille's imports as later years showed some decrease, until in 1916 the imports of oil seeds were only 453,600 tons. Meantime, and even before the war, Great Britain had been gaining until her total imports in 1916 became 1,300,000 tons of the raw materials valued at more than 100,000,000 dollars. Hull is the largest crusher of oil seeds in the world to-day and is now equal to Marseille in the palmy days of 1912. To be sure, Hull's oil yield is not so great since the seeds on which her mills operate are of low oil content, the soya bean being the largest item as regards tonnage and the lowest when yield of oil is considered, while Marseille crushes copra with its 63 per cent and groundnuts with their 40 per cent of oil. Both countries are amply supplied with fatty food materials.

Perhaps it might be more accurate to say that they are now oversupplied with the fatty acids from the oils and it may be that their manufacturers are at their wits' ends to find channels for the disposition of the same fatty acids. One can no more make an omelet without breaking the egg, than can the manufacturer of glycerine deliver it without breaking down the oil molecule into fatty acids. It is the glycerine that makes the oil and what to do with the fatty acid residues must be causing great concern. These products are not foods, but are used for soap and candle making almost exclusively. If all the oil that flows from the British presses were used for glycerine, the yield of the latter, counting an average yield of 22 per cent of oil from the seeds, or 286,000 tons of oil, would be 25,740 tons of glycerine and 260,260 tons of fatty acids—enough to make more than a half million tons of soap.



View of Chinkiang, One of the Principal Cities in the Export of Groundnuts

At any rate, the United Kingdom, since the outbreak of the war has gained the premier position in Europe as a crusher of oil seeds. The palm kernel industry has been taken over from Germany and considerable increase has been made in the groundnut and copra trade, two of Marseille's staples, and the vital interest, says a recent consular report, of the industry in wartime as a supplier of propellant explosives, margarine for food and feed cake for cattle has been realized as never before. Meantime the United States has made some slight gains along the same lines of imports, but depends for her supplies on the cottonseed industry, crushing in the period from August 1, 1916, to July 31, 1917, some 4,500,000 tons of seed that yielded 1,350,000 tons of oil, about half of which came into commerce in the refined condition. Her cotton growers are just now beginning to learn that there is 10 dollars more profit from an acre of peanuts (groundnuts) than from cotton, and districts where the boll weavel is rampant are planting the groundnut over wide areas that bid fair to revolutionise the oil crushing industry of several of the southern states and in time will put the United States into the class of exporters of this oil as well as that from cottonseed.

The Soya Bean

Among the agricultural products of North China perhaps the soya bean is the most important. It provides food for man, for beast, and for the soil. It is a rich producer of valuable oil of a semi-drying class usable for various foodstuffs, paints, waterproof goods, soap, varnish, printing ink, celluloid and for lubricating and lighting. Bean cake is noted as a fertilizer. In extent of uses and value it is the most important legume grown in Asiatic countries.

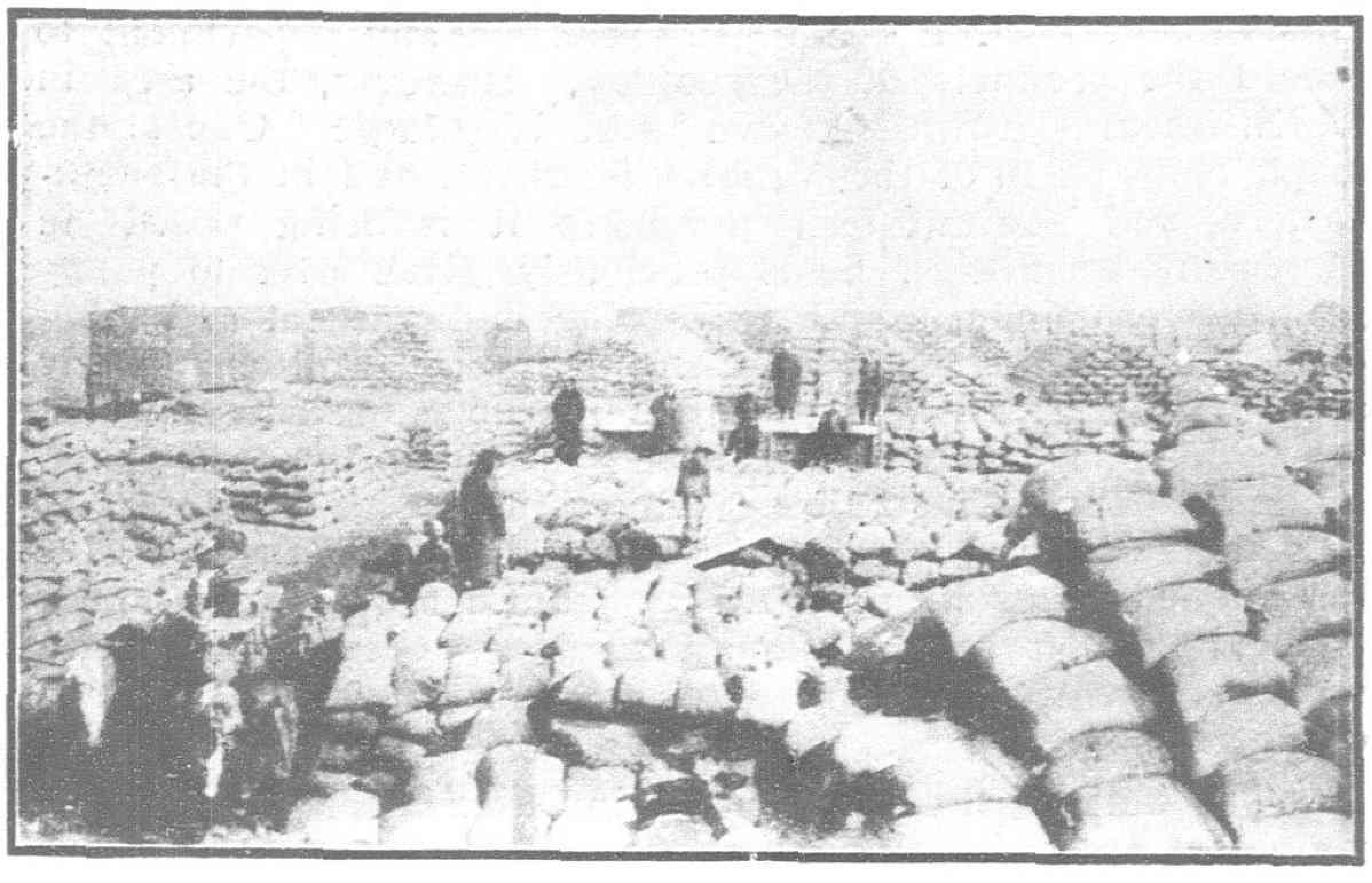
The bean is grown in nearly all parts of Manchuria where agriculture is conducted, except in the extreme north, and bean cake and oil constitute Manchuria's chief export. The Manchurian farmer relies upon the bean as a cash crop and it constitutes a staple product of agriculture in that section of the country.

Gradually farmers are planting it farther and farther south in China Proper and alternate it with other crops. In Manchuria it is successfully grown in semi-arid regions, in valleys subject to floods in the rainy season, and in northern latitudes similar to the Dakotas and Minnesota.

The beans are almost entirely produced by hand methods. The seed is usually planted in April in rows 17 inches apart, the plants about two inches apart in the rows. In some districts, however, the beans are planted in 24-inch rows, allowing about seven plants to the foot. The harvest takes place in September, the plants commonly being pulled before they are quite mature, to avoid shattering the pods. The thrashing of the seed is usually accomplished with a stone roller, or by trampling, and the winnowing, by throwing the beans against the wind, a practice in vogue throughout China with all cereals.

The beans are bought by Chinese merchants and stored at railway stations. No grading is attempted, the stored beans being of all varieties and mixed more or less with sand and trash. The exporters buy the beans from the merchants simply

SACKING BEANS AT CHANGCHUN



BEANS AWAITING TRANSPORTATION

by weight, but before shipment the beans have to be sorted. The crude methods of marketing, the lack of any effort to minimise loss by grading and by freeing the beans from dirt, etc., causes loss to the farmers which they will not be able to estimate until the Government undertakes to teach them.

As to the yields obtained by the Manchurian farmer, there is considerable variation in the figures given by different authorities. Bean experts estimate the yield from 1,100 to 1,600 pounds to the acre, commercial authorities from 1,600 to 1,800 pounds, and Japanese agricultural experts from 400 to 2,000 pounds. In the best producing districts the average yield is said to be more than 1,800 pounds. No reliable statistics as to the cost of production are available, but according to data secured from bean growers the approximate cost per acre is placed at $4.42.

In 1916 some 10.6 million piculs of bean cake were shipped from Dairen alone (a picul being equivalent to 133⅓ lb. avoirdupois). Nearly 1.2 million piculs for bean oil were exported to Europe and America. The combined output of all the Dairen mills was approximately 6,527,000 piculs in 1915, and 8,592,000 piculs in 1916.

The three principal ports of shipment from Manchuria are Dalny, Newchwang, and Antung, and the following are the statistics for 1916, expressed in piculs:

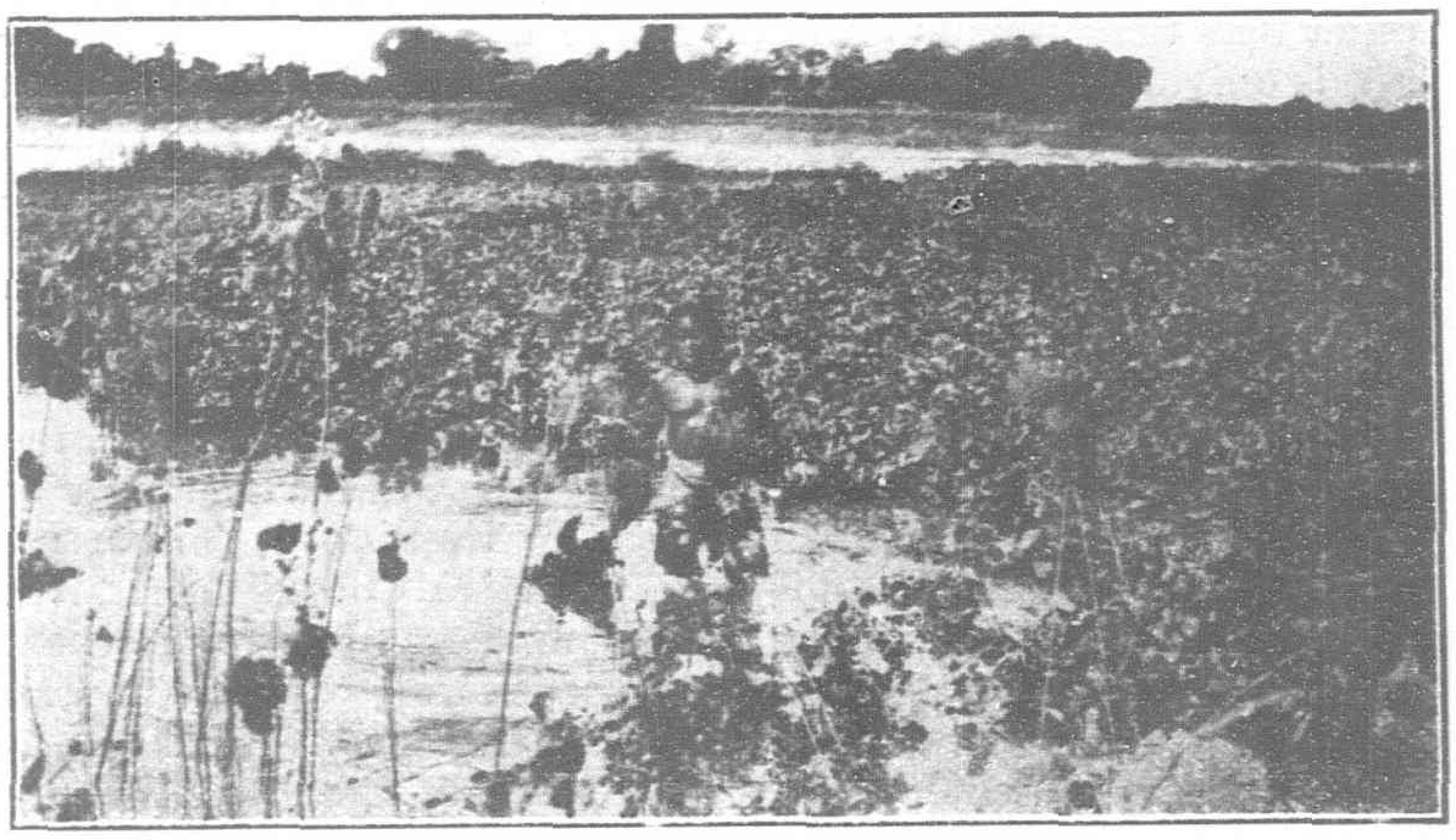
	Bean Cake	*Bean Oil*	*Other Beans*
Dalny	10,025,661	1,185,583	2,884,103
Newchwang ..	2,911,335	75,756	1,483,582
Antung	739,264	37,762	271,432

"Other beans" are classified on the market as black, green, small green, red, white, yellow, and minor varieties, the yellow bean being the chief.

In China Proper the chief centres of soya bean production are Hunan and North Anhwei Provinces, while growing is proceeding in Shantung. Bean cake to the amount of 31,236 piculs and bean oil, 90,935 piculs, were exported from Tsingtao in 1916, though it must be noted that in 1914 the export of bean cake was 170,158 piculs.

The general manufacture of bean cake could be and should be expedited and rendered more efficient. In Manchuria the manufacture of oil and oil cake is not confined to large centres, as every centre of bean production has its native mill. The method of extracting oil in these native mills is decidedly primitive. The beans are first crushed beneath a millstone and then steamed for about fifteen minutes. The resultant mass is spread out and placed in circular iron frames, about six inches deep. Five of these frames are placed one above the other in a vertical press consisting of four uprights, with cross beams at the top and bottom. Pressure is applied by means of wedges driven in between the crossbeams and beams placed on top of the frames, and the oil is thus pressed out. During the past few years large bean mills, equipped with modern machinery, have been erected, and these are able to extract three to four per cent more oil. In these large mills only about one half the oil is extracted by the usual process, that is, by crushing the beans steaming them, and using hydraulic pressure.

At least three mills using the solvent process of extraction, involving the use of benzine, are in operation in Manchuria and Japan. One such mill in Manchuria has a maximum capacity of 80 tons of beans every twenty-four hours. Only 50 tons of beans are, however, crushed daily, producing seven tons of oil and 40 tons of meal, the three tons lost consisting of moisture, dust, and dirt.



CHINESE FARMER SAVING BEAN CROP FROM RIVER FLOOD

Wheat and Flour

China has a great opportunity to score with her wheat and flour if immediate organization is undertaken. The middle of September brought important advices from both America and Australia, great wheat growing countries. The Exports Board of America announced that in order to conserve supplies the export of wheat and flour, among other things, has been prohibited unless they are to be used for actual war purposes. In Australia, too, action was taken to curtail wheat exports, and to prohibit them entirely to the Dutch East Indies in particular unless under conditions which would prevent their re-export. This measure is aimed, of course, at the illicit trade which is believed to be conducted with Dutch bottoms for German benefit. Another item of news from America which should awaken the Chinese Government is that the flour mills at Minneapolis are closing owing to the scarcity of wheat, which act is regarded as an unprecedented occurrence in the middle of the harvesting of the crop.

How much wheat China grows is unknown. In fact, statistics of any crop cannot be regarded as reliable, for the

Government itself has not yet organized any department to record the products of the country. However, the area in which wheat is grown is known to be very large. One of the staple crops north of the Yangtze is wheat, and in the southeastern and southwestern provinces it is being raised in increasing quantities, fields previously given over to poppy growing for opium purpose now being under wheat and other crops. The crops plain of China is pretty well completely sown with winter wheat. Over 200,000,000 bushels of wheat are certainly harvested annually in Central and Western China, while Manchuria must harvest anything from 10,000,000 to 20,000,000 bushels, while it is estimated that if all the available unoccupied lands in northern Manchuria are brought under cultivation that section should produce, even with native methods of cultivation, some 300,000,000 or 400,000,000 bushels of wheat.

The bulk of the wheat grown in China is consumed by the people, and up till thirteen or fourteen years ago the modern mill was not known in the country, all the flour used being ground in native mills or at peasants' homes.

As each year closes greater interest is being taken in modern milling methods and in northern Manchuria (Harbin), Hankow, and Shanghai districts, the establishment of factories is increasing. There are between twenty and thirty modern mills operating in northern Manchuria alone, while outside of Manchuria there are mills running with the capacity of some 54,700 bags of 50 lb. per day—30,500 at Shanghai; 3,200 at Hankow; 13,200 at Wusih; 1,000 at Wuhu; 1,600 at Kaoyou; 2,000 at Haichow; 800 at Tsinanfu; 800 at Changsha, with odd mills at Peking, and other points. Mills known to be in course of erection or nearing completion are estimated to produce another 6,000 or 7,000 bags per day.

These mills indicate that the total production of wheat for other uses than consumption by native mills and family grinding is only about 25,000,000 barrels annually. What is used in the native mills never figures in any trade reports and cannot be guessed at. It must be large since the areas under wheat are known to be very extensive. "The supply of wheat for the modern mills is, owing to conditions, irregular, and until there is some better system of culture and caring for China's grain crops, and until wheat raising in general has been placed upon a more stable basis, there can be no dependence upon the amount or quality of wheat produced by China during any particular season or upon its equal distribution." These are reflections of Mr. G. E. Anderson, the U. S. Consul-General at Hongkong, who adds: Even when sufficient acreage of wheat is planted to supply these native mills at full capacity for an entire year the manner the grain is gathered and stored results in such waste and such poor quality of grain that the economy and consistent working of the mills is rendered difficult and even impossible. Chinese wheat is so poor and comes in such dirty condition that Chinese flour manufacturers are unable to secure from it anything like the ordinary proportion of flour obtained from wheat in other parts of the world. And on the other hand there is no very satisfactory or profitable outlet for these larger elements of waste of by-products. Only the cheapness of Chinese wheat in most seasons, and especially in years of good crops, has rendered Chinese flour mills possible, and even with good crops it is doubtful if the industry in a whole is at all profitable under existing conditions.

Experts have pointed out in other reports that the Shanghai mills experience the same difficulties encountered by the Hankow and Harbin mills in the purchase of their stocks of wheat. The Chinese grower and middleman handling the wheat have not yet learned the necessity of observing absolute honesty in preparing their products for sale to the mills. Taking advantage of the fact that the wheat goes considerable distances to market and cannot be properly examined until it reaches the mills, they purposely add quantities of dirt, stones, and other foreign matter to their wheat, hoping thereby to be able to be paid the same price for the foreign matter as for the wheat. Often soaking of the wheat is resorted to, to increase its weight. The result of this practice is, according to one Shanghai mill, that wheat supplies average ten per cent dirt.

In addition to these disabilities under which the roller mills operate there is the lack of system of elevators or wharehouses for laying in large stocks at proper seasons to guard against shortages or speculation. China has not profited at all from the lessons being taught in the matter of grain storage by America or Canada, and in this direction there is room for immediate action. If the war has caused greater extensions in this direction in other countries surely China has every reason to make a beginning. To meet war conditions Canada and the United States are extending their elevator systems, and in Victoria and Australia, the Government is planning to spend $3,656,000, gold, in the installation of a complete system of grain elevators during the war. These elevators will be constructed of cement and will be cylindrical in shape, and will be equipped with machinery to turn the wheat so as to keep it in good condition. Here is an object lesson to the Chinese Government, which can boast of no storage capacity of modern type in all the country.

Apart from this essential the Government should see to it that technical training is given as far as possible to native labor, and steps should be taken to develop transportation facilities by building roads. China has the advantage of cheap labor, cheap wheat, abundant consumers, cheap low grade flours, containing the bulk of middlings in favor with the Chinese trade, and ability to turn out a product which sells for from ten per cent to thirty per cent cheaper than the imported article. With these advantages there is no reason why the industry should not be a great, advantageous, and profitable one for Chinese farmers, people, and investors.

Some of the Shanghai mills have improved their product by mixing with the Yangtze Valley grain quantities of hard Manchurian wheat, but apart from this the Shanghai flour is better milled than, and is superior in color to, the Manchurian product, export grades of which come only from Harbin and its immediate vicinity.

Shanghai roller flour has been able to take a large place on the Hongkong market, but it is certain that unless there is a big improvement in the quality of wheat, etc., it will not be able to meet the American makes when freight charges are reduced and the price of American wheat is lowered by the cessation of war demands and prices.

The combined output of the seven principal flour mills in north Manchuria, before the outbreak of war in 1914, was estimated at 89,725 tons, valued at $4,187,854, gold. The quantity of wheat milled was 127,465 tons. In 1913 the flour output totaled 74,304 tons, and the increase of 15,421 tons is due to the demand for north Manchurian flour in Mukden, Antung, and Dairen.

Imports of flour into Manchuria through Dairen decreased from 234,623 piculs in 1914, to 10,497 piculs in 1915, and 6,763 piculs in 1916, principally due to higher prices demanded for the imported product, caused by the increased demand in Europe. And with the continuance of the war the dearth of flour will pretty well clear this market for the locally milled variety if there is enough of it. As it is an ill wind which blows nobody good it is to be expected that China will reap a benefit by the incentive which might be given to put her house in order, better the crops, the method of handling them, and the expansion of the milling industry.

The total import of flour to China in 1915 was 177,367 piculs, valued at Tls. 865,842; and in 1916, 233,464 piculs, valued at Tls. 1,174,544. High grade imported flour will always command a market while it is superior to the home-made variety, and unless the Government stirs intelligently it always will be.

Eggs and Egg Products

The egg trade has become an exceedingly important one. In 1915 egg albumen and yolk was exported to the value of Tls. 4,864,925, and in 1916 it had risen to Tls. 7,702,403. Fresh and preserved eggs exported in 1916 were valued at Tls.

2,970,837, while frozen eggs increased from Tls. 875,942 in 1915 to Tls. 1,658,237 in 1916. The total trade of egg products, then, in 1916, amounted to Tls. 12,331,577. There are now great modern factories at Chinkiang, Nanking, Hankow, and numerous minor factories at other ports, which produce the albumen, etc.

Egg raising is practically universal. There is no systematic poultry farming. Every farmer raises chickens, as incidental to other agricultural activities and eggs are sold to collectors, who traverse the country. For instance in the area supplying the factory at Nanking some 75,000 dozen eggs are daily collected, the collecting agents paying round about 40 to 42 cents per gross.

The eggs of the brown Leghorn are considered most desirable for export on account of their size and weight, and are chiefly intended for use by bakery and confectionery establishments abroad.

The great egg producing districts are the Yellow River and Yangtsze River Provinces, the season of greatest production being February and May. Swatow was also always a large exporting port. The regions of Hankow, Kiukiang, Wuhu, Nanking, and Chinkiang on the Yangtze, and places in Shantung Province have now become the chief centres.

Here again roads would facilitate and make the trade more profitable. The fragile egg and the rough trail do not agree, to say nothing of the time that is absorbed in collecting and getting to market. At the foreign factories the price ranges about $6.50 per 1,000 eggs, and it is stated that when the price rises to about $9 per 1,000 the big factories are unable to operate.

There are some twenty egg product factories in China, of which ten are under foreign control, the remainder being under Chinese management. A description of the latest factory at Shanghai was published in the FAR EASTERN REVIEW of October, 1916.

In Shantung and elsewhere in the north chickens are raised by a native process of incubation, the eggs being placed in earthernware jars, which are placed on the brick kongs, or beds, under which a fire is always kept burning. The womenfolk, too, strap eggs about their waists under their heavy clothing and thus transform themselves into ambulatory incubators. Fifteen years ago eggs could be bought in Shantung Province at the rate of 900 eggs for about $2 Mex., now they range at about 360 for that amount, if not less. In 1911 the number of fresh eggs exported from Tsingtao was 27,000,000, and a large number went out by rail. It is estimated that during the spring season the export trade is upwards of one million eggs per day from Shantung, much of it now going down the railway to Pukow for the factory at Nanking. Manchuria exported in 1916 a total of 29,537,415 fresh eggs.

Yet this great business is built up without any assistance from the Government, and indeed. without any particular knowledge of its progress. There are certain waterways by which the farmer can get to market, and these exist despite the neglect of the administration to care for them, but there is nowhere a road in existence which will allow of safe and speedy transport of so delicate a product.

An important fact which the Government might note is that there are German factories now closed down because they could find no ships to take their products. These factories mostly make albumen, but one—and the only one of the kind we believe at Hankow—manufactures dessicated egg. Egg yolks are here made into a powder soluble in water, and of egg products it brings the highest price, for one reason because the supply is extremely limited. Now that it is in the power of the Government to liquidate German firms there is an opportunity to acquire some going concerns which might well form the nucleus for co-operative Chinese industry in which the producers will be able to acquire something more than the mere pittance which their eggs produce.

Feathers

As a by-product of poultry raising there is money in feathers for the Chinese farmers. In 1913 the export was valued at over Tls. 1,750,000, though it fell in 1915 and 1916 to Tls. 599,550 and Tls. 772,529 respectively, owing to the war. But despite the possibilities many producers make trading more difficult and less remunerative by their efforts to swingle the buyer by splitting the quills and filling them with sand or gypsum to add to the weight, while fowl feathers washed in rice water are mixed with duck and goose feathers with the object of cheating the buyers. The feathers are, like eggs, and hides, etc., collected from the farmers and sold to some central buyer who in turn sends them to the export merchants, and the producer loses by the cost of transportation as well as by the effect of adulteration.

Pheasant Farms.—Although there is nothing done on a large scale in the shape of poultry farming by specialists it is interesting to note incidentally that in some parts of South China, and particularly about Yunnanfu there are large farms devoted to the raising of the golden and silver pheasant, chiefly for their feathers. Altogether there are twelve farms of some size, one raising on the average 200,000 birds per year, while the total output is something like 300,000 birds, and may be more. The birds are raised as ordinary fowls. In some cases the eggs are hatched in Chinese incubators, and the chicks are raised in native brooders. Birds are usually sold at Yunnanfu for from $1 to $1.20, silver. The skins and feathers are generally exported. The curing is done simply by immersing in a solution of carbolic acid for disinfection, by treatment with alum preparation, and steaming and then drying. Select skins and feathers are then cased and sent to Hongkong, and the remainder are despatched in bales. At Hongkong all the product has to be rehandled. Both skins and feathers have to be cleaned and graded and repacked for shipment abroad, and here again is loss caused to the producer. Why the whole business cannot be done at the place of production is a question that ought to be gone into. Up to the outbreak of war most of the shipments were handled by Germans. This is one line of Hun business—small, of course, but able to be expanded—which might well be taken over by the Chinese, and as a first step the Government might prove to the producer what he loses by careless and inefficient handling of his product. Likewise the Government might see if pheasant raising cannot be inaugurated in a large scale on the Yangtze Valley.

Canning Enterprises

If the Government really starts to investigate food supplies it might thoroughly look into the canning of game, etc., with a view to perpetuation of the industry, of course, and also the preservation of the game. There has been much comment in the press of late of the danger of the insiatiate maw of the factories at Hankow and Nanking gobbling up all the game in the Yangtze Valley. In season and out the preservers are running their stewing pans and their canning machines, and the pheasant, etc., etc., instead of enjoying a close season, are snared, trapped, shot or caught by any means at all times of the year, by day and by night, and clapped into cans. Well might the Government seriously view this matter. In 1916 the export of preserved and frozen poultry and game was valued at Tls. 3,425,264, though the Customs report does not state definitely exactly the proportion of the game. People who are conducting the agitation for the preservation of game regard the export as excessive, so it is to be presumed that they know whereof they are speaking.

A quantity of fruit is canned in Hongkong and Macao in the fruit season, and game and fish at other times. There are three factories in Hongkong equipped with American machinery, the largest one using 2,000 crates of tin plate a year for tins. Canning has become the chief industry of Macao, where there are eleven or more factories. The value of their output, in

1913-14, was roughly $4,600,000 Mex., and $3,800,000 in 1914-15. They turn out about 140,000 cases of preserved food yearly.

A new company was some time ago formed at Tsingtao by Chinese and Japanese, with a capital of $100,000, silver, to can fruit and meat.

Grass Cloth and Ramie Fibre

An industry that has great potentialities is that of so-called grass cloth manufacture. It is a material mostly woven from ramie fibre, the best quality closely resembling foreign linen. In 1916 foreign markets absorbed cloth to the value of Tls. 1,710,336, and an improvement in the industry and general development of communications to facilitate transportation would, as in the case of numerous industries, bring about a great expansion in the trade.

Ramie is perhaps the most important fibre grown in China. It chiefly comes from Kiangsi Province and in northwestern Fukien, though it is largely grown in Hunan and Hupei as well as in Szechwan, where it also appears in a wild state. In China it is called the dry or mountain hemp. Botanically it is known as *boehmeria nivea*, while the Chinese call it *chuma*. The root is planted in the spring, and will continue fertile for five years before replanting is necessary. Most farmers in central Hunan reap two and sometimes three crops a year. It is one of the strongest fibres known, is extremely durable, and has a brilliant lustre. At present the fibre is taken from the plant entirely by hand, and here is where decided improvement might be effected. A higher price could also be obtained for it if the gummy substance which is now removed abroad could be dealt with in China. How the trade in the raw fibre is growing can be gauged from the fact that from an export of 2,000 piculs in 1903 it has increased to 210,931 piculs valued at Tls. 2,821,208 in 1916. In 1915, 318,000 piculs were exported.

The weaving of the grass cloth is done mostly by women, and constitutes a "cottage industry." Hand looms of native make are used. In so-called "factories" the weaving of one piece 34 yards long by 17½ inches requires the whole time of a woman or girl for several days, and she is paid approximately 50 cents gold for her work. The price of this piece, say at Amoy, is about $3 gold, a considerable part of the value being made up of transit dues, duties, and transportation charges. The method of production also enhances the cost. At present, in order to assemble the product of different places where the cloth is made, collectors go from house to house, and from village to village, and buy bolts of cloth. Having collected 100 bolts the collectors then sell them to a buyer, who might operate a factory. These in turn sell them to buyers from the coast. As a rule there are no roads or railways, with the result that most of the product has to find the coast on the backs of pack animals, traversing long and tedious trails. Each lot of 100 bolts would cost about $300, but on the market each lot is subdivided according to quality, the value of the individual bolts being determined by the character of the weaving. The finer grades of bleached cloth sell for between 3½ and 9 cents gold per foot.

By intelligent organization this industry should easily assume great proportions, since the fibre can be, and is, converted into the most beautiful articles for the foreign trade by the Chinese themselves, in the form of drawn-thread work, etc. In Canton, Fukien, Hunan, and Szechwan, in particular, most artistic work is produced.

General Fibres

China's fibres are not confined to ramie. Hemp, jute and abutilon are all produced and marketed, though here again the producer is obstructed rather than encouraged, by transportation to market being one of the largest costs, apart from taxation, and by the general loss due to crude methods of production, collection and sale. Hemp grows in various parts of China and Manchuria, the chief producing provinces being Kwangtung, Chekiang, Hunan and Szechwan. In 1915 the export was valued at Tls. 850,822 and in 1916 Tls. 1,699,371. The usual method of production is to steep the stems of the plant—which are some eight feet in length—in water and after being dried in the sun bleach them with burning sulphur, the fibre being removed later. The fibre is largely consumed in China, being used for coarse cloths, ropes and twine, brushes, etc. The ashes of the stems are also utilised for the making of powder for firecrackers.

Abutilon grows mostly in Szechwan and western China though it also thrives in Chihli, Mongolia and Manchuria. Being inferior in quality it has not much demand abroad, though what is produced is consumed locally, chiefly as fishing nets, the fibre possessing great water resisting properties. It is often called jute by mistake and when used abroad is employed as an adulterant.

Jute is grown in Chihli and Kwangtung and Szechwan. In 1915 the export to foreign countries was valued at Tls. 482,326 and in 1916 at Tls. 493,970, of which the value of Tls. 122,249 went direct to foreign countries from Tientsin, in addition to Tls. 203,080 to Chinese ports.

Apart from the export of raw fibre it must be noted that bags to the number of 8,630,210, valued at Tls. 390,127 were exported in 1915 and 6,136,530 valued at Tls. 441,560 in 1916, while cordage exports were valued at Tls. 243,832 in 1915 and Tls. 276,935 in 1916, the cordage being made of hemp, ramie and jute. Fishing nets exported were valued at Tls. 240,858 in 1915 and Tls. 211,087 in 1916. From these figures the Government can see the possibilities of an industry which is already established, despite difficult conditions, and which might be developed a thousandfold by scientific organization. Attention must be given to the weakness of the Chinese to adulterate their shipments to gain temporary advantages. Latest shipments show that the practice is increasing and the trade suffers in consequence, prices being lowered on account of the cost of sorting.

Indigo

An industry to which the Government might very well give prompt and close attention is that of indigo production. Something like Tls. 10,000,000 per year used to be spent by dyers in China on foreign—mostly German—indigo. Years ago great quantities of the dye were grown in Kwangtung, and in parts of Chekiang and Kiangsi Provinces. During the past ten years the Chinese product has gradually been forced from the market, and now that war has stopped all German shipping and trade the artificial article has likewise mostly disappeared. The opening caused by the war has prompted growers in China once again to plant to meet the market demands, and the Government ought to see to it that the farmers are able to extend the industry. It is better for the country than opium growing, and the very fact that Tls. 10,000,000 can be kept within the country ought to be sufficient inducement, apart from the fact that a trade which used to be a large one will be revived, to make some start at organization. Before the war Shanghai used to import some 250,000 casks per year while 20,000 went to Hongkong for distribution in Kwangtung, Yunnan, Kweichow and Fukien Provinces, and all this was German make.

Drugs and Chemicals

[By A Layman]

One rarely has occasion to buy chemicals or drugs in China, or in any part of the Orient, in this the fourth year of the Great War, without being reminded that the scarcity of one thing, or the total lack of another, either makes one's purchase very expensive or renders it impossible to fill a prescription.

The total output of many of the largest chemical works in the world has been requisitioned for war purposes. The need abroad is increasing, and the shortage in China is becoming more and more painful as the Chinese cultivate, through the introduction of modern medical science, a demand for drugs and chemicals from abroad. Yet China possesses the ingredients of practically every medical compound in use—certainly all the elements in the chemist's table—and many of the simple vegetable and mineral medicines, which are largely used, and therefore largely imported, are here in abundance and require no other treatment than a little simple refining.

Many patriotic Chinese and nearly all foreigners who are interested in seeing China participate to the fullest in the prosecution of the war, and at the same time develop economically, are making industrious inquiries into the products that China can export and the manufacturers that she can undertake which will be at once in her own interest and in the interest of the Allies. The manufacture of drugs therefore must suggest itself to any one who has reason to deal with a chemist's shop or who has even a vague conception of China's great resources, both vegetable and mineral.

In the Customs report upon foreign trade in China it is casually mentioned that since the beginning of the war the Japanese have established in the leased territory of Kuantung factories for the manufacture of sulphuric acid, compounds of barium, caustic soda, creosote, hardened bean oil for the manufacture of soap, stearine, and glycerine. It may be safely assumed that these products are being produced from materials available in Manchuria otherwise the plants would be established in Japan and not in Kuantung. What the Japanese can do in the manufacture of such simple and such essential chemicals, the Chinese can do. The Japanese surplus of drugs, which has vastly increased, is sold in bulk to Russia and is no more than sufficient. Very little, except cheap patent medicines, is available in China, and there is very little export to western Europe. There is a big field for the sale of all the drugs needed in war abroad and a good local market for all the household remedies which are simply manufactured, but which are still imported from abroad at great cost and with no little difficulty. America has kept foreign hospitals and pharmacies in China supplied in most of the chemicals upon which there are European embargoes; but when American troops are in the field in great numbers the Americans will not be so ready to share their chemicals with China, and there will be a drug famine in the East which will drive local chemists to turn manufacturers on a small scale for their own customers. The Chinese plant which is then ready to supply the Eastern market and at the same time to export the chemicals in most need in Europe will have an opportunity to build up a flourishing business in China.

The policy which a manufacturer should pursue in establishing a business of this sort would be to inquire what drugs are most difficult to secure and most needed in China, and from such a list readily obtained, to select a few simple chemicals which could be simply and cheaply prepared in this country. As soon as one thinks of drugs, raw materials in abundance suggest themselves. China has for instance unlimited quantities of borax, rhubarb, licorice, nitre, alum, sulphur, musk, lime, opium, ginger, Indian hemp, nux vomica, corrosive sublimate, arsenic, belladonna, camphor, sandalwood, cubeb, cinnebar, soda, castor oil, many of the phosphates, metals of all kinds in compounds used in medicine, and thousands of well-known herbs which are of recognized value. The wide range of climate would make it possible to cultivate such valuable plants as those which produce quinine and santonin. Many ingredients could be obtained from equatorial Asia without difficulty.

In the manufacture of ointments, medicated soaps, and the like, the oils used are readily obtainable in China. There is plenty of wool from which to prepare lanolin, plenty of kelp for the manufacture of iodine, minerals for the manufacture of calomel, cotton in Shantung which is in great demand abroad for the preparation of sterilized and medicated cotton, enough tea sweepings in Hankow to supply the whole world with caffeine, and coal and coal oil from which such a wide range of valuable drugs and chemicals are extracted. Alcohol and ammonia could be made in any quantity, the most important acids could be cheaply produced, and with them such products as nitrate of silver could be manufactured. The list is inexhaustible, and the materials are almost all readily obtained. The greatest difficulty would probably be to obtain technical experts of such calibre that the purity and even quality of the products could be relied upon absolutely, and yet such men should be available in every large city in China. A Chinese census of returned students shows that in Peking alone there are 16 Chinese graduates of foreign universities who have specialized in chemistry and 28 foreign trained doctors of medicine. The numbers in large commercial communities are probably much greater.

To insure that such a work as the manufacture of drugs was started under the best possible auspices, nothing better could be suggested than that the initiative come from a conference of Chinese and foreign physicians, chemists, and pharmacists, and that they as a conference undertake to interest Chinese capital in the establishment of plants and while taking the initiative, guarantee the success of whatever investments were made by supervising manufacture and patronizing the native manufacturers. Or the Chinese themselves should accord some interested foreigners the facilities to stablish, develop, and expand industry in this very specialised field. Out of such a move would undoubtedly grow the production of a great surplus which could be exported to the benefit of the Allies at war and to the profit of China.

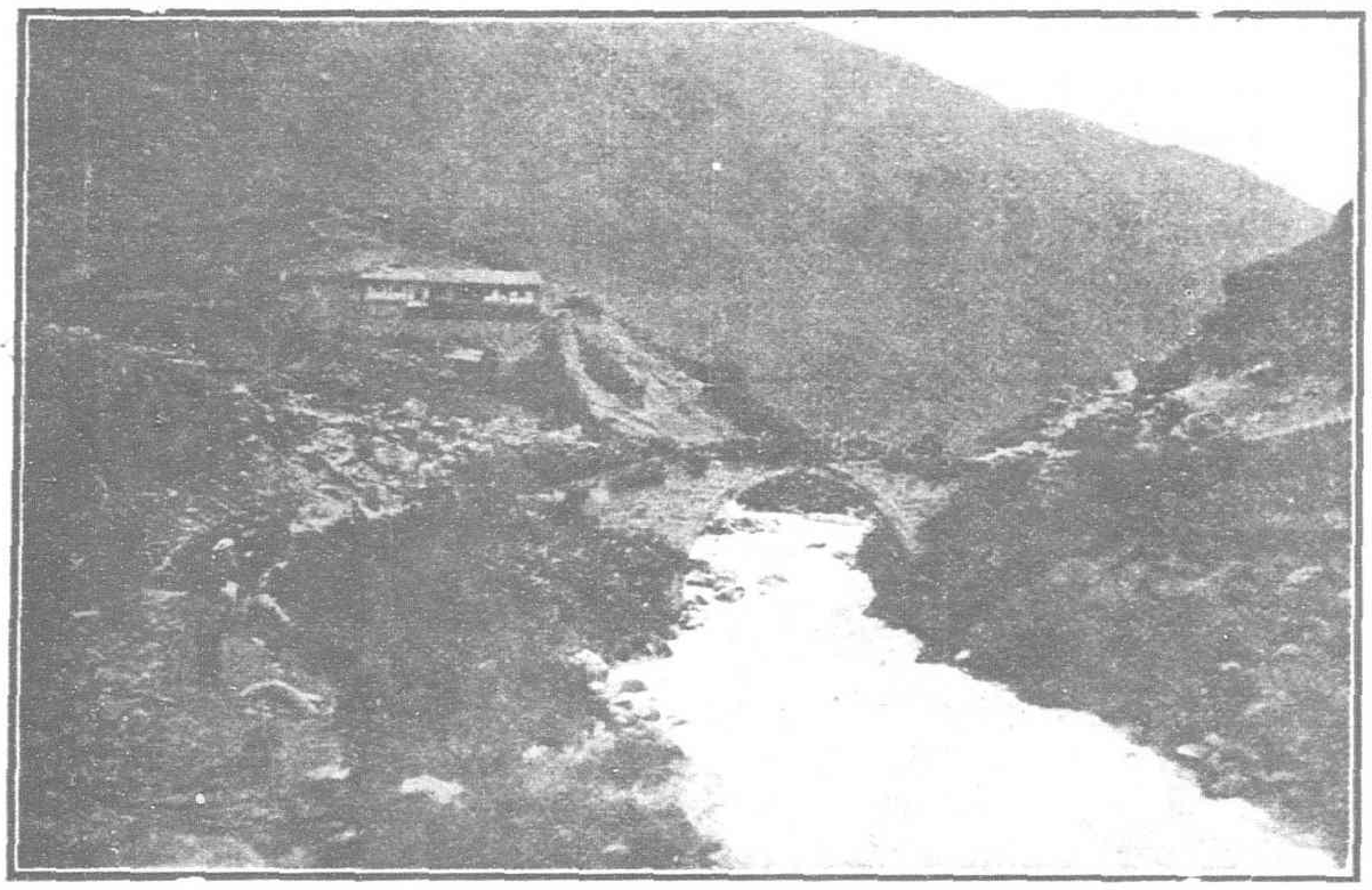
Musk

Musk is one product of world commerce in which China practically enjoys a monopoly, not a large one to be sure since the annual output is at best only some $400,000 gold, but the product itself is worth many times its weight in silver, and for that matter, gold as well, in these days of high exchange. About one half of the total output stays in China and is used especially by the Cantonese in compounding pills that form the best known remedy in the Chinese pharmacopaeia for Asiatic cholera. The Chinese also use musk to keep moths out of furs and clothing, and as a perfume, the odour being quite popular in the better grades of perfumery.

Practically all of China's musk comes from Thibet through the Szechwan frontier, the chief markets being Sungpan and Tachienlu, the former being by far the more important. Sometimes, when the road from Sungpan to Chengtu is unsafe, owing to brigands, part of the musk will be taken south and marketed to Tengyueh to go to India. This happened to a considerable part of the output in 1915, when 6,890 ounces out of a total of 25,367 was so shipped. The value of the 1915 musk crop was $266,000 gold and the average price $10.10 an ounce. In 1916 some 25,160 ounces valued at $407,000 gold were shipped. France has been the largest purchaser of China's musk owing to its commanding position in the perfume industry, the United States being second, until 1915, when the latter forged ahead and bought more than a quarter of the entire output.

Good musk is bought for ten times its weight in silver at Sungpan, and at Chungking for 18 to 25 times; so there is a heavy profit somewhere. Small supplies are brought out to various points along the Lungan road, where every coolie seems to have some about him, and the inns reek with the sickly smell. The musk is brought down in its pod, and the best kind is recognised by a nice brown colour, and in its pure state by its overpowering stench; pods with greyish or dull-coloured musk are rejected. It is retailed by $\frac{1}{100}$th of an ounce, but it is adulterated more than any other articles in the Chinese market. The musk that is sent to Shanghai is said to contain up to 50 per cent of dried bullock's blood, fine sand, lead, and other foreign matter, the tribes near Sungpan do not, however, understand the art of adulteration although the Thibetans certainly do.

By far the largest herds of musk deer are to be found on the southern shores of the Koko-Nor, and the supply of musk



Bridge on the Border of Thibet, Which Most of the World Must Cross on Its Progress to Singpan and Tachienlu

there is larger at T'aochou than comes through Sungpan. Great quantities of musk and of other drugs do not come to Sungpan at all, but are sent east to the great market of Yuchou, in Honan, where a fair is held in the 9th and 10th moons, many of the Sungpan traders visiting this place. At Tachienlu musk is the most valuable export, practically every hong reeking with it, and nearly all the Thibetans who come from the far interior bring some with them. The price of medium musk then is 13 times its weight in silver.

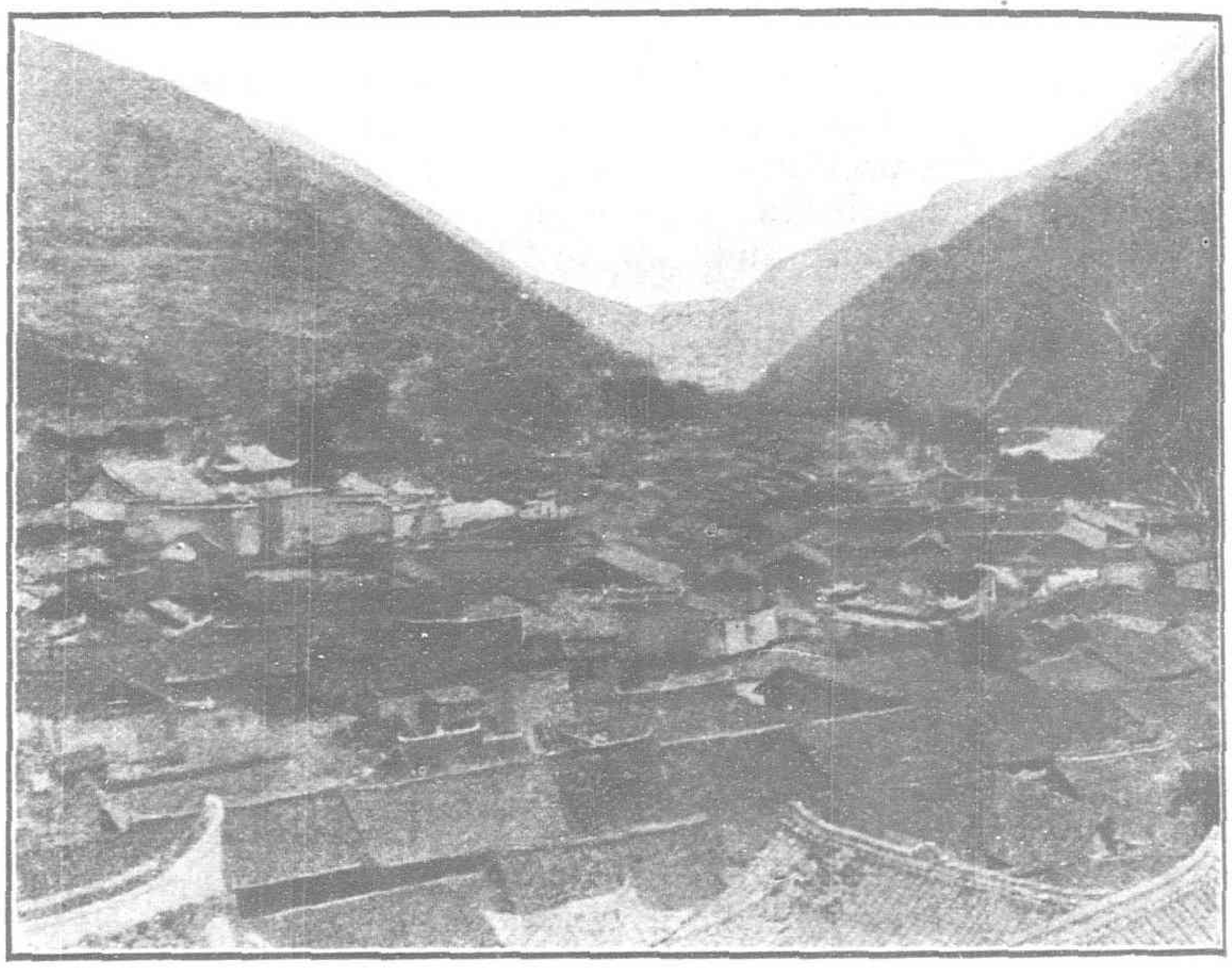
Musk is a secretion of the male musk deer and three kinds of musk are distinguished in commerce, the most important and valuable being the Chinese of Tong-king musk, imported principally from Shanghai. It is put up in small tin-lined, silk-covered caddies, each containing from two to three dozen pods. These are generally adulterated to an enormous extent with dried blood, fragments of leather, leaden pellets, peas, etc., so that often little more than the smell of the original tenant of the pod remains. The Chinese pods vary greatly in value according to quality and genuineness. Some musk collected from the western Himalaya is exported from India. It is much less prized than genuine Tongkin musk. The third variety, known as Kabardine, or Siberian musk, is exported from Central Asia by way of Russia. It is in large pods, said to be yielded by a distinct species of deer, and is very inferior in point of odour.

Good musk is of a dark purplish colour, dry, smooth, and unctuous to the touch and bitter in taste. A grain of musk will distinctly scent millions of cubic feet of air without any appreciable loss of weight, and its scent is not only more penetrating but more persistent than that of any other known substance. As a material in perfumery it is of the first importance, its powerful and enduring odour giving strength and permanency to the vegetable essences, so that it is a principal ingredient in nearly all compounded perfumes.

Musk, or some substance possessed of the musk odour, is also contained in glands in the jaw of alligators and crocodiles, whence it has been extracted for use in perfumery in India and Egypt. The musk ox and the muskrat (Indian and European) are, as their names indicate, remarkable for a musk odour. The musk deer differs from the typical members of the deer family and stands by itself as an isolated zoological form, as both sexes are entirely devoid of any sort of frontal appendage and the upper canine teeth of the males are remarkably developed, long, slender, sharp-pointed, and gently curved, projecting downwards out of the mouth with the ends turned somewhat backwards. Among the anatomical peculiarities in which it differs from all true deer is the presence of a gall-bladder.

The musk deer has a wide distribution over the highlands of central and eastern Asia, including the greater part of southern Siberia, and extends to Kashmir on the southwest and Cochin-China on the southeast, always, however, at great elevations—being rarely found in summer below 800 feet above the sea-level, and ranging as high as the limits of the thickets of birch, rhododendron, and juniper, among which it conceals itself in the daytime. It is a hardy, solitary, and retiring animal, chiefly nocturnal in its habits, and almost always found alone, rarely in pairs, and never in herds. It is exceedingly active and sure-footed, having perhaps, no equal in traversing rocks and precipitous ground; and it feeds on moss, grass, and leaves of the plants which grow on the mountains among which it makes its home.

Most of the animals of the group to which the musk deer belongs have some portion of the cutaneous surface peculiarly modified and provided with glands secreting some odorous and eleaginous substance specially characteristic of the species. The situation of this specially modified portion of skin is extremely various, sometimes between the toes, as in sheep, sometimes on the face in front of the eyes, as in many deer and antelopes. Sometimes it forms a distinct pouch or sac. This is the form taken by the special gland of the musk deer, which cause has made animals so well known, and which has proved the source of an unremitting persecution to its possessor. It is found in the male only, and is a sac about the size of a small orange, situated beneath the skin of the abdomen. The secretion with which the sac is filled is of dark brown or chocolate colour, and when fresh is described as being of the consistence of "moist gingerbread," but becoming dry and granular after keeping. When the animal is killed, the whole gland, or "pod," is cut out and dried, and in this form reaches the market of the Western world, chiefly through China.



Tachienlu City, One of the Largest Primary Markets of Musk

Owing to the great value of musk to the perfumer, the chemist early tried to solve the problem of making it artificially, and finally one Baur accidentally succeeded in imitating the odour in a compound made by linking the radicle of benzene and that of tertiary butyl alcohol. It is not a true musk, as the natural product belongs to quite a different class of chemical compounds. However, "Musc Baur," as it was called in the trade, enjoyed great popularity and sold for $20 gold a pound as far back as 1900, the product so sold being adulterated with 19 times its weight of acetanalid, so that the Chinese who sophisticate the real musk with a few per cent of lead are not to be blamed when the foreigner deliberately puts out an article that contains only five per cent of the odorous principal. There are other artificial musks in the market now and the adulteration with inert chemicals has ceased. None of these, however, has the power that makes the product of Thibet so valuable, that of fixing the more fugitive floral odour and giving the resulting perfume lasting qualities that are lacking in cheaper grades whose odour is sweet when moist, but vanishes as the solution dries.

Metals and Mineral Resources of China

In our last issue we dealt to some extent with metals and minerals. That there is great and urgent need for scientific investigation into this field of enterprise and potential wealth goes without saying. In 1916 China exported metals and minerals in various forms to the total value of Tls. 45,237,775, while she imported metals and minerals in various manufactured forms to the value of Tls. 26,058,531. It is significant, however, that in the matter of machinery of various kinds for the purpose of setting up new industries, or for use in factories already established, she only brought in material to the value of Tls. 6,321,531. This is a feature which the Government, or the War Commission, might carefully study. To take advantage of her resources China must introduce modern machinery, and to do that effectively the Government must boldly tackle the question of reforms to foster economic development in its broadest aspects, taking steps to facilitate the erection of factories under modern scientific management, and of widening the way for the investment of foreign capital, with or without Chinese co-operation, in those fields which will make for the enrichment of the people and the country by finding new avenues of employment and by utilising on the spot the resources available.

Of the metals that were exported in 1916 antimony ranks first, the value of the regulus and crude antimony sent out being Tls. 11,823,503, the ore (exported) totaling Tls. 1,383,243. Copper was valued at Tls. 9,066,681, iron Tls. 6,858,722, and metals and minerals unclassed totaled Tls. 5,756,968. We allude to the latter because we do not find specific mention in the Customs reports of manganese, tungstan, chromium, molybdenum, or mercury, for all of which there is demand at this time, and as to the export of which we can find little information.

Some manganese is mined in Kwangtung Province, near Fongchang, in the neighbourhood of Pakhoi. It is sold to the Hanyehping Company at Hankow and to Japanese buyers. Deposits have been found in Hunan and there are possibilities of development in that province. Manganese, tungstan, chromium, and molybdenum are all used for giving special properties to steel. Tungstan, for example, gives steel the special property of holding its temper even when heated, and therefore it has been in special demand in war time for making cutting tools and lathes for turning shells. Molybdenum can be substituted for tungstan, but it has another use which the French discovered. By putting it in certain high explosives it stabalizes them and enables them to be handled safely. Mercury is used for making subshate of mercury, which is employed in the caps of shells, etc. It is found in south China, and production could possibly be stimulated.

All together there are some 26 kinds of minerals to be found in nearly every part of China greater or less quantities. When war broke out there were registered 4,962 coal-mining properties with total of 133,513 acres; 535 iron ore properties of a total of 8,283 acres; 28 tin properties of 3,700 acres; 154 antimony properties of 718,175 acres; 199 gold properties of 29,522 acres; 18 silver properties of 3,333 acres; 16 lead properties of 2,335 acres; 79 copper properties of 7,431 acres. The aggregate output of petroleum, sulphur, quicksilver, lime, orpiment, asbestos, etc., was then 317,022 tons, with a mining area of 3,754 acres divided into 195 properties. Since the outbreak of war there have been a few further registrations, and certain foreigners interested in metals useful for war purposes have visited the country to investigate possibilities, but so far no developments in this connexion have taken place, though the Government would do well to take advantage of the times and facilitate the investment of foreign capital which is now ready to flow to China for mining purposes.

Iron and Steel Production

As the war has progressed in Europe it has become increasingly apparent that a large and continuous supply of steel in various forms is one of the first essentials to success. Each of the contestants used in a few months their accumulated stock of supplies, and each has found it necessary to reorganize existing works and build new ones in order to continue the war. Not only guns, shells, and similar war materials have been called for in unheard-of quantities, but locomotives and railway supplies, motor cars, machine tools, and a multitude of things more often thought of as instruments of peace than war have had to be furnished. Even now, after three years of war, the big demand is for railway materials in Russia and ship plates elsewhere. It has been shown abundantly that no country can fight a successful modern war unless it be on a sound and independent basis as regards steel and iron. This is one of the first things China must arrange. Temporarily the country will have to depend on its Allies, but whether to meet the present emergencies or as preparation for the future China must arrange for a local supply of iron and steel.

Japan and Chinese Pig Iron Output

The present annual output of pig iron in China, aside from furnaces in Manchuria, is about 300,000 tons. Of this, approximately half is produced by the Hanyehping Company and part by small native furnaces in the various provinces. The pig iron made by the native furnaces is mainly consumed locally, and is not available for export or for any new use. There is small reason to suppose that the quantity made by the native furnaces can be increased materially in any short period, and their operating costs are high.

In Manchuria the Japanese control blast furnaces at Penshihu which make about 30,000 to 35,000 tons per year. With the completion of extensions now under way the output will be brought up to 70,000 tons.

At Anshan also, construction has been begun on blast furnaces, but it will necessarily be a year or more before iron can be made there. The pig iron made in Manchuria is shipped to Japan for conversion into steel and can hardly be counted as part of China's resources. Certainly it is not available to meet Chinese needs now.

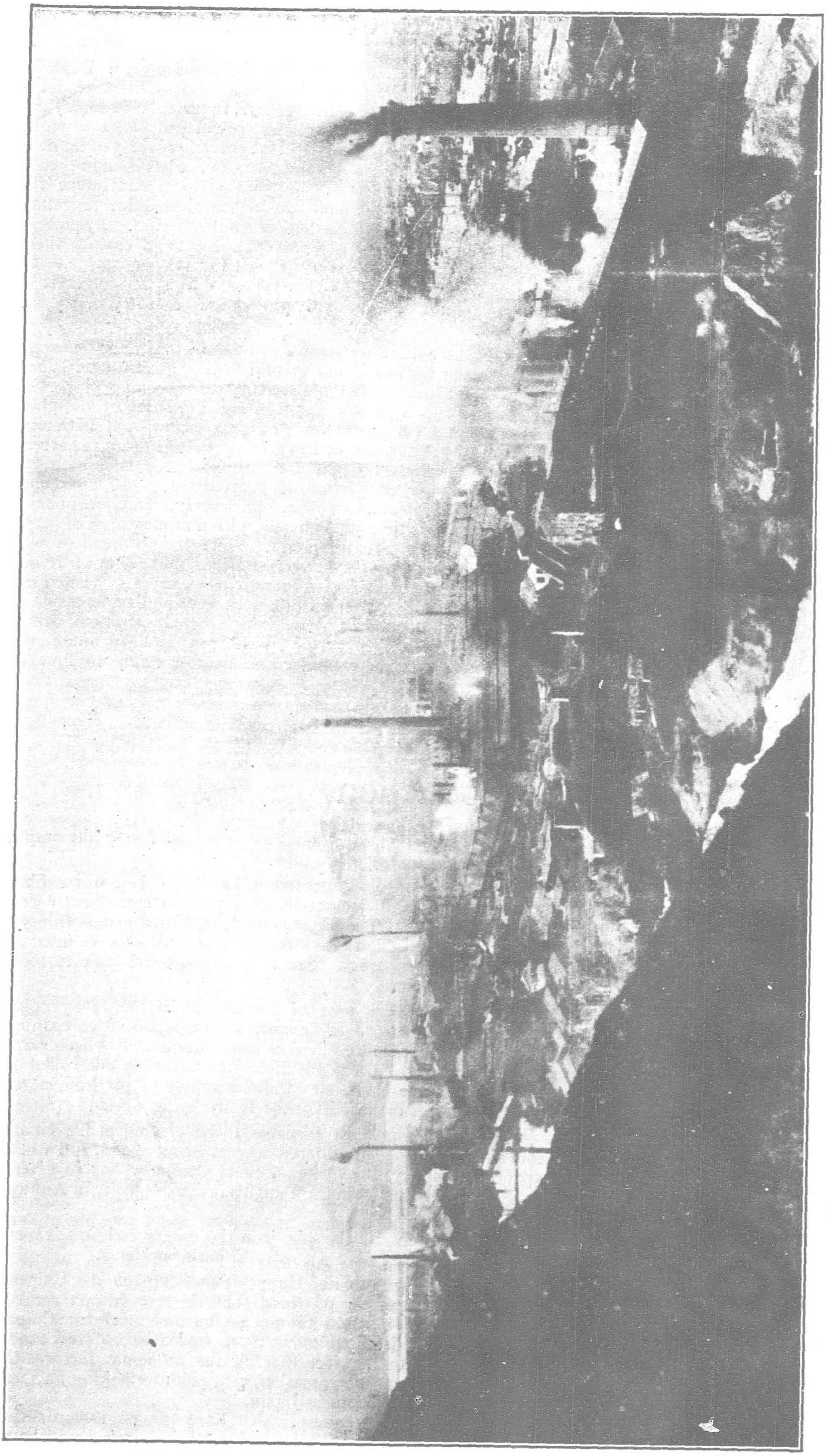
So, too, a large part of the output of the Hanyehping furnace has been sold in advance to the Japanese companies, and within the past few weeks announcement has been made of the formation of a new Japanese steel company controlled by Ysukana and Co., which is to draw its supply of pig iron, stated at 5,000 tons per month, from the Hanyehping works.

Two additional blast furnaces to be erected at Tayeh are reported to have been ordered a year or more ago, and a new Japanese company, the Oriental Steel Company, has just been floated to make iron from the Tungkwanshan deposits in Anhwei Province.

Unfortunately all the pig iron is earmarked in advance, and its manufacture does not solve China's problems.

In granting ores to the Hanyehping Company the Chinese Government has wisely provided that the ore from a certain deposit can only be used to make iron and steel for China. Except for this it is possible that there would be no steel made here now, despite the fact that all the economic factors, of materials, labor, transport, market, etc., point to making finished products here rather than in Japan.

The Chinese companies which have moved towards the establishment of a local iron and steel industry have been managed on such impractical lines as to become hopelessly



The Hanyang Iron and Steel Works

involved financially, and it was largely as a result of this the Japanese have obtained their hold on the Chinese iron industry.

As is pointed out on our editorial page there are many reasons why such a hold is vital to Japan, and no one can complain over the Japanese protecting their own interests in such matters.

The Ore China Might Control

There is no use crying over spilt milk. The practical thing to do is to consider what China can do to establish her own economic independence. It must be recognised that now, faced by a great emergency when an adequate supply of steel is vital to the needs and dignity of the country, China is helpless despite possessing large reserves of raw material and affording every opportunity for successful development.

As to iron resources we have already indicated in articles printed in the Far Eastern Review within a few months that the total ore available in China is much less than has been commonly supposed. There was a time when estimates were current crediting the Hanyehping Company alone with having at Tayeh a reserve of from 100,000,000 to 300,000,000 tons. No such estimates are now made, and in the judgment of engineers familiar with the ground the company has title to just about enough iron ore to complete the contracts with the Japanese, aside from the single deposit reserved for Chinese uses. It is now an open secret that the company is so cognisant of this situation that it has at various times brought heavy pressure to bear at Peking to secure the allotment of more ore.

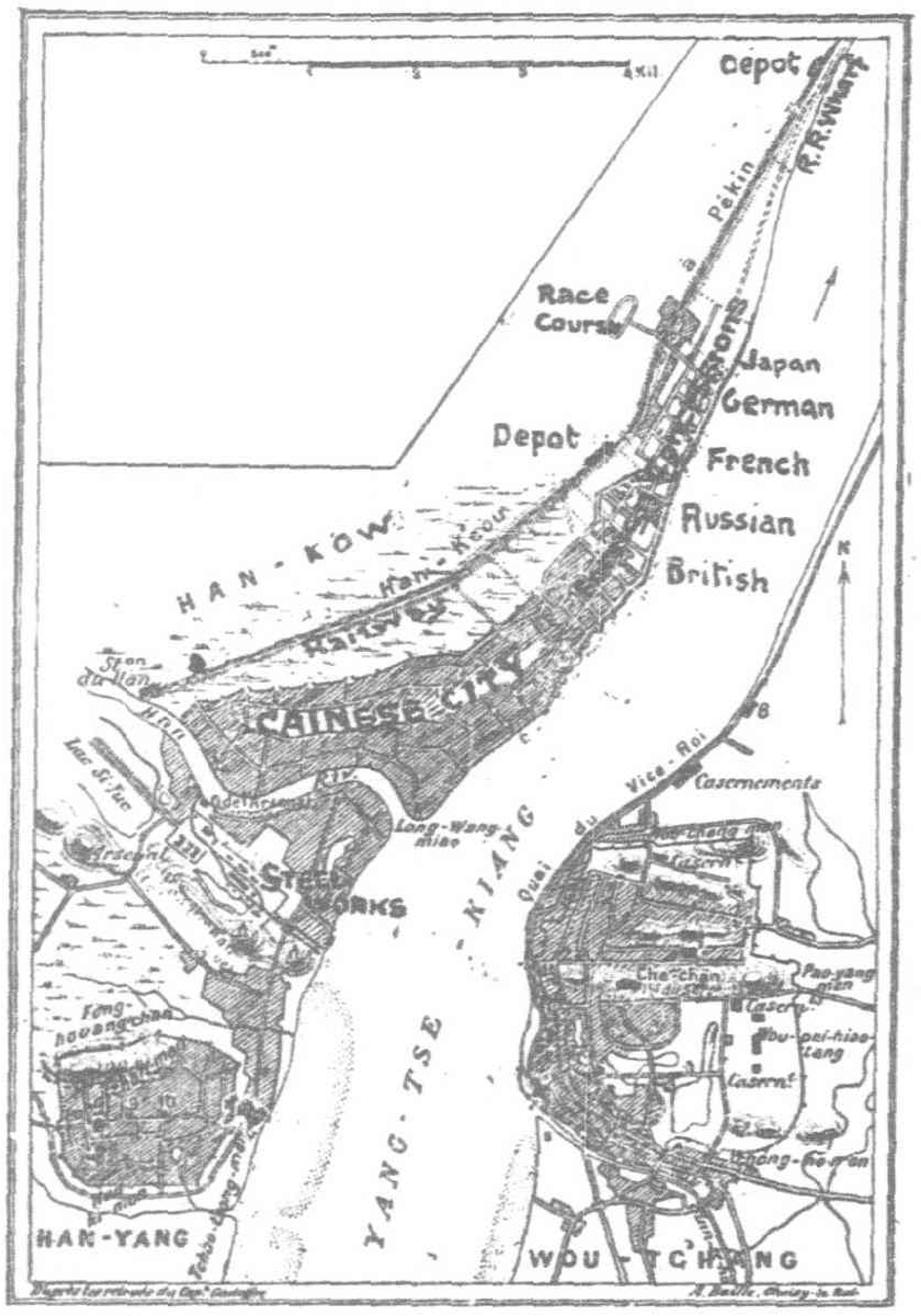
Of the present known ores which are of such character and so situated as to be available for modern treatment the Chinese Government retains title to a probable tonnage of somewhere between 100,000,000 and 150,000,000. Japanese or Sino-Japanese companies, including those in Manchuria, have approximately 170,000,000; Chinese companies and individuals have rights to 50,000,000 to 70,000,000. It must be understood that these estimates of tonnage are not exact, but represent the best available data as to the probable output of the mines. No attempt has been made to calculate the tonnage of such deposits as those in Shansi, which are not suitable to large scale production by modern methods, or deposits in the far interior provinces, which, because of transport difficulties, cannot be made available for many years.

It is evident that the Chinese Government has been sufficiently liberal, both to its neighbors and its own citizens, in the granting of rights to iron ore, having given away approximately two thirds of its patrimony. Despite the liberality to others the Government now faces a serious situation without any adequate means of meeting it. Owing to the agreement made with Japan as a result of the famous Twenty-one Demands it cannot exercise the ordinary governmental rights of commandeering existing works and converting them to its use, this being expressly prohibited in the case of the Hanyehping Company, the only one operating. Whatever is done must be new and that raises the question as to building national iron and steel works.

Possibility of National Iron and Steel Works

Among the deposits to which the Government retains title are several for development, and large enough to warrant building works. The selection from among them will necessarily be determined by many conditions, among which the presence of the ore is only one. It requires as much coal as iron ore to make steel, and the coal must be of special quality. Limestone, too, is needed, as are good building sites, a plentiful supply of water, good transport from the mines and to the market. Indeed, many things must be taken into account. It is necessary to find the point at which all the essential material can be assembled at the least cost and the manufacture may be carried on most economically.

In peace times steel making is a highly competitive industry, and to make a commercial success of a steel plant it is necessary to manufacture as cheaply as competitors do, or at least so cheaply as to allow sale of the output on a competitive basis. If the Government is to avoid the mistakes of previous attempts to make steel it must take such things into account.



MAP OF HANKOW SHOWING LOCATION OF HANYANG STEEL WORKS

The amount of money involved in opening the mines, building the furnaces and mills, and in establishing a steel business, is so large, running perhaps to $20,000,000 gold, that the venture should only be undertaken under expert management and control, and after careful studies have been made, which will permit the business starting on a sound basis. The emergency is, however, so great and the provision of a supply still so vital to China's real independence that a start should be made at once.

Whether for war or peace China needs steel, and advantage of the present opportunity should be taken to meet this need. There can be no doubt that both America and the Allies will give China every assistance in such a venture, and this is one thing China cannot do alone. With a good modern works established the business can be built upon in response to the needs of the Government and the commerce of the country, but to get the first unit help will be needed.

If it were possible it would be highly desirable to rush the proposed plant to completion so as to meet the war needs of the Government and to sell any surplus at present high prices. Unfortunately this may not prove altogether feasible. So large and complex a plant as is needed cannot be built quickly, even if all the preliminary information as to deposits were available and the designing work compiled. Furthermore, owing to war conditions, it would only be by special license of the United States Government that orders for the necessary materials and machinery could be placed, filled, and transported. This could probably be obtained, but the necessity must be taken into account. Finally, the price which would need to be paid if the material and machinery were ordered to-day would be so large that the total cost of the plant would be excessive, and it could never earn a profit in ordinary times in competition with other plants now in operation. While it is impossible to say, without actually taking bids, at what price an order could be placed, it may be mentioned that structural steel and billets which are the cheap raw materials entering into the plants are now selling at four to five times ordinary prices in American centres of production. A plant built immediately would cost probably three times what it should, and the promise of quick delivery would certainly lead but to disappointment.

Aside from these difficulties no large plant could be built immediately in any event since many preliminary studies must be made. It is entirely possible that by the time such studies are completed prices will have gone down or means found of meeting the situation. The present time should be used to make studies of the deposits, to open the mines, to prepare foundations and design the plant, and to have all specifications ready so that bids can be taken at the first favorable opportunity. Undoubtedly prices will drop at the first sign of peace, and quick action then will probably permit buying on very good terms. It is expected that average prices will be higher after the war for some years at least, but as it appears that even if the products were sold at 1914 prices, which were much below the average, a well built and well run Chinese steel plant, if properly located would have many advantages.

Requirements of New Works

In planning a works it is well to keep in mind the variety of materials that will be needed and the extent to which it would be possible to supply them from local sources. The list includes:

1. Ordinary building materials for use at the colliery, iron mines, and steel works. Of these materials sands, rock, lime, fire-clay, fire-brick, building brick, and cement would be available in China, and all would be needed in large quantities. Timber, structural steel, glass, pipe, fittings, hardware, would all be needed equally and would necessarily come from abroad.

2. Railway materials including sleepers, rails, locomotives, and trucks for use in and around the mines and works. These must come from abroad, excepting perhaps the rails.

3. Furnace material, such as magnesite brick for the open hearths which formerly came from Germany and can only be obtained now from America with great delay and expense. Dolomite, a local material, may be substituted, but it decreases the annual output of each furnace, increases the cost, and promotes accidents and delays.

4. Special steel shapes and plates such as are necessary for making a blast furnace. It is difficult now to get a small steam boiler in China, but the proposed plant would not only require many boilers but the shell of each blast furnace itself may be compared to a boiler 20 to 25 feet in diameter and 90 to 100 feet long, and this is the simplest part of the furnace,

5. Heavy and light machinery, including engines, dynamos, motors, cranes, presses, rolls, lathes, air compressors, pumps, and many minor items. Some of these are of enormous size and require months to design and construct even in the largest and best equipped machine shops. An impression of the size may be conveyed from the fact that the pumps would need to be large enough to supply from seven million to twelve million gallons (33,000,000 sheng) of water per day, which is enough for a large city. One single pipe for the air blast of the furnaces, called the bustle pipe, weighs fifty to one hundred and fifty tons (2250 piculs), depending on the particular design chosen. The various engines are so heavy that they require especially firm foundations, and the blowing engines—which furnish air blasts to the furnaces—require about ten thousand horse power, enough to drive a good sized ocean steamer.

As illustrating the difficulty in securing prompt delivery of all this material in war time it may be mentioned that at Hanyang a fine new blast furnace has stood idle for two years despite the high prices that would be realised from its output, because the company has been unable to obtain a few minor parts.

A second important matter to be taken into account is the time which is necessary to open and equip mines sufficient to furnish ore and coal for a thousand ton plant, and to design, build, and erect the furnaces and mills. To do this properly will require from two to three years, and it cannot be greatly hurried without considerable sacrifice of money, even in ordinary times. The Tata Iron and Steel Company of India occupied five years in prospecting, opening its mines, designing and erecting its works.

To make 1,000 tons of steel per day will require approximately the following quantities of the principal materials, the exact amount depending on the quality of the particular ore and fuel selected:

Iron ore, 1,600 to 2,000 tons; coal, 1,500 to 2,500 tons; limestone 500 to 600 tons. This amounts to several train loads per day for even a well-equipped railroad, and at the works and mines several miles of track would need to be built. Preliminary to opening either iron or coal mines it is necessary to prospect the ground by trenches, pits, or bore holes, all of which takes time. It is probable that the Government can develop an adequate supply of coal for steel works only by opening deep mines, and to sink shafts 1,500 feet deep and open a colliery alone is a big job for two years. Apart from the colliery, however, it will be necessary to build coke ovens, with all the special devices for saving the sulphate of ammonia which is valuable for fertiliser, the benzol which is needed to make high explosives or to use in motor engines, and the tar for which there are many uses. The steel plant itself, in order to be a good paying investment, must include mills for making many articles such as rails, bar, wire, sheet steel, tin plates, galvanized iron for roofing, etc.

Each of these is a problem in itself and true economy points to taking ample time for planning and designing. All of these difficulties are so many more reasons for making an early start. It is well not to under-estimate them, but it is equally important not to be unduly discouraged by them. The fact that to do the job right will require time is all the more reason for getting at it at once. No one can be sure how long the war will last, and a supply of steel is all important if China is to take part now or at any time in a long continued war. It is no less important if China is to develop her own industry peacefully.

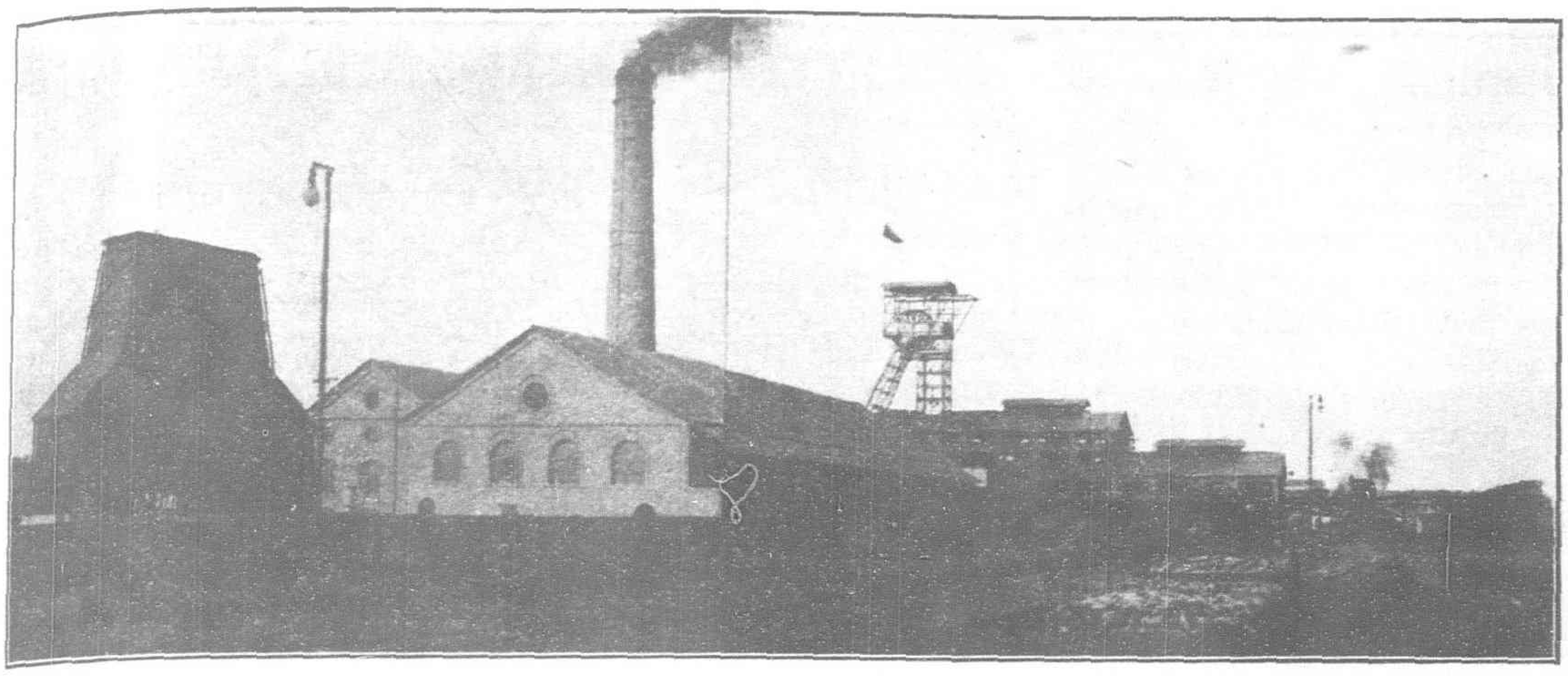
Coal Production of China

The total annual coal production of China amounts now to about 18,000,000 tons, of which 8,000,000 comes from the larger mines having modern equipment and being in the main under foreign control or administration. According to figures collected by the Geological Survey of China for the year 1915, the most recent year for which figures are available, the outputs of these mines were as below:

Name of Mine	*Locality*	*Nationality*	*Production tons*
Kailan Mining Administration	Kaiping and Lanchow, Chihli	Sino-British	2,971,792
Fushun Colliery	Fushun, Mukden	Japanese	2,034,856
Pingsiang Colliery	Pingsiang, Kiangsi	Chinese	927,463
Peking Syndicate	Chaotso, Honan	British	480,875
Pengshihu Coal Mining Co.	Pengshihu, Mukden	Sino-Japanese	275,777
Lincheng Coal Mining Administration	Lincheng, Chihli	Sino-Belgian	259,703
Chung Hsing Coal Mining Company	Yishien, Shantung	Chinese	244,825
Tsingching Mining Administration	Tsingching, Chihli	Sino-German	179,154
Paoching Company	Yangchuan, Shansi	Chinese	131,396
Liuhokou Coal Mining Company	Liuhokou, Honan	Chinese	91,822
Tungshing Company	Mentoukou, Chihli	Sino-British	80,000

The German mines at Fangtse and Hungshan in Shantung were stopped by the war in 1915 and have since been in the hands of the Japanese. Of the mines listed above but few are in position to furnish coal for export. The Fushun Colliery has suffered an accident and its output has been temporarily reduced. It is in the interior of Manchuria and the main source of fuel for the Japanese railways and other enterprises in that country. Pingsiang, under Chinese control, is far in the interior of south China, has poor transport facilities to Hankow, and is barely able to supply sufficient coal for the Hanyang steel works with which it is affiliated. Pengshihu is a new colliery in south Manchuria developed to supply Japanese blast-furnaces and doubtfully able to supply any excess of coal at present. The Chung Hsing mines can deliver to Pukow on the Yangtze and are able to furnish coal of excellent grade. At present the equipment is limited and until improvements now under way are completed only a small amount could be supplied. In any arrangement covering more than a year this company might well be taken into account, but for any shorter period it may be disregarded except as to furnishing a small supplementary supply for use on the Yangtze. The Tsingching mines have been taken over for the Chinese Government as a war measure. The colliery is near Peking and possibly through the active co-operation of the Chinese Government could be devoted exclusively to war work and special rates for export granted over the Government railways to Taku. If so, we are told it could furnish 1,000 tons per day of an excellent bituminous coal. The Paoching mines are in the interior and supply of railway cars for steady shipment over three railways are so far uncertain. The Tungshing mine, near Peking, furnishes anthracite, and is now under Anglo-American management. Unfortunately the colliery is now drowned, and it will require six months to recover it. Even then the local demand for fuel at Peking is capable of absorbing the entire output.

The mines remaining, the Kailan, Peking Syndicate, Lincheng, and Liuhokou, are the ones on which reliance must be placed for coal for export at present and for the immediate future. In considering their possibilities it is to be remembered that China even now imports 1,000,000 to 1,600,000 tons of coal annually, and that under normal trade conditions there would be an excess of imports over exports. In time China may be expected to become a considerable exporter on a strictly trade basis, but now export must be considered as a war measure. It is dependent in any event upon the furnishing of adequate shipping. The only coal companies undertaking to make foreign deliveries, the Kailan Mining Administration and the Peking Syndicate, have lost ships by commandeering and probably would not be able to assume the burden of finding vessels.



Kailan Mining Administration—The Tongshan Colliery

The Kailan Mining Administration is a British-Belgian-Chinese Corporation operating five modern collieries in northern Chihli and delivering coal over the Peking-Mukden line of the Chinese Government railways to Chinwangtao, a deep-water port at which the American transports touch. It is the largest mining enterprise in China and is under excellent business and technical administration. Several different beds of coal are worked and bituminous coal of considerable variety as to quality can be supplied. As dressed for the market the best lump coal is delivered to contain an average of 10% ash, and the poorest slack 25%. The volatile matter runs 26 to 37%, sulphur 1%. The run of mine contains about 30% lump and 70% slack, though in the lump is included much that under American practice would be classed as coarse nut. The coal has an excellent reputation throughout the Far East and a grade called "Naval Coal" is especially highly esteemed. The company has a large reserve capacity and an excellent organization. With reasonable notice as much as 2,000 tons per diem could be placed at the disposal of the Government though the amount and price would necessarily depend upon the exact grade ordered. If only lump be accepted the Administration would have necessarily to take into account the cost of mining and storing two tons of slack for each ton of lump. If the Government could make use of mine run a very favorable price could doubtless be secured.

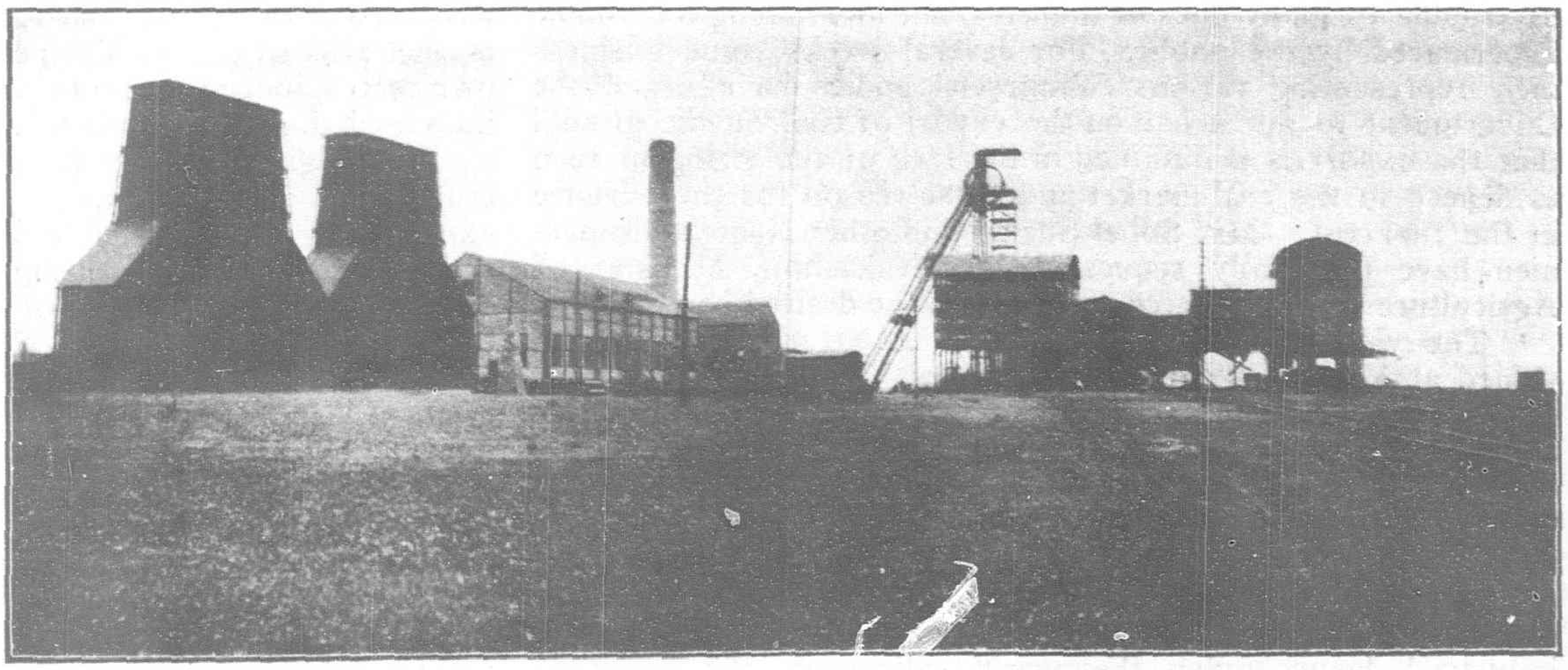
The Peking Syndicate operates modern collieries in northern Honan and delivers to Tientsin and Hankow over the Kin-Han Railway. The coal mined is an anthracite and is excellent in grade. It is furnished in a wide variety of sizes and qualities. It should be remembered that this is a high grade steaming coal, which is hard and so subject to very little deterioration. Shipments can be begun at any time and under suitable guarantees as to amounts taken. Free deliveries can be brought up to 1,000 tons per diem within three or four months. The cheapest route to tide water is by way of the Kin-Han Railway to Hankow. The present rate is $4.50 per ton. It is possible that for war purposes the Chinese Government might grant a special freight rate. It is to be remembered that in winter, water at Hankow is occasionally so low in December, January, and February, that it is not economical to use large boats and in view of the low cost of transfer where hand labor is abundant, any plan for Hankow deliveries should consider the advisability of employing barges and accumulating stocks at some down river port so as to economize on the time of the more expensive ocean steamers.

The Lincheng and Liuhokou mines are under control of a Belgian Company for which M. Mamet is Chief Engineer. The two collieries furnish high grade bituminous coal, delivering to the Kin-Han Railway. The Liucheng Company has been restricted as to output by difficulties with water and the Liuhokou by the limitations imposed by a poorly equipped 2-ft. guage railway from the colliery to Kin-Han. However, if a suitable contract covering future deliveries can be made these mines might deliver 400 tons per diem from Lincheng and 200 to 300 from Liuhokou. There is a surplus mining capacity at Liuhokou and by supplying a couple of small locomotives and heavier rails (30 lb.) for 15 miles of track, coal can be obtained quickly. The Lincheng Company has an arrangement for special rates on the Kin-Han line under which it can deliver to Hankow for $4.55 per metric ton and to Taku for $3.90 Mex. The Liuhokou pays open rates and is at a disadvantage. If any attempt be made to use these coals there should be an adjustment of railway rates.

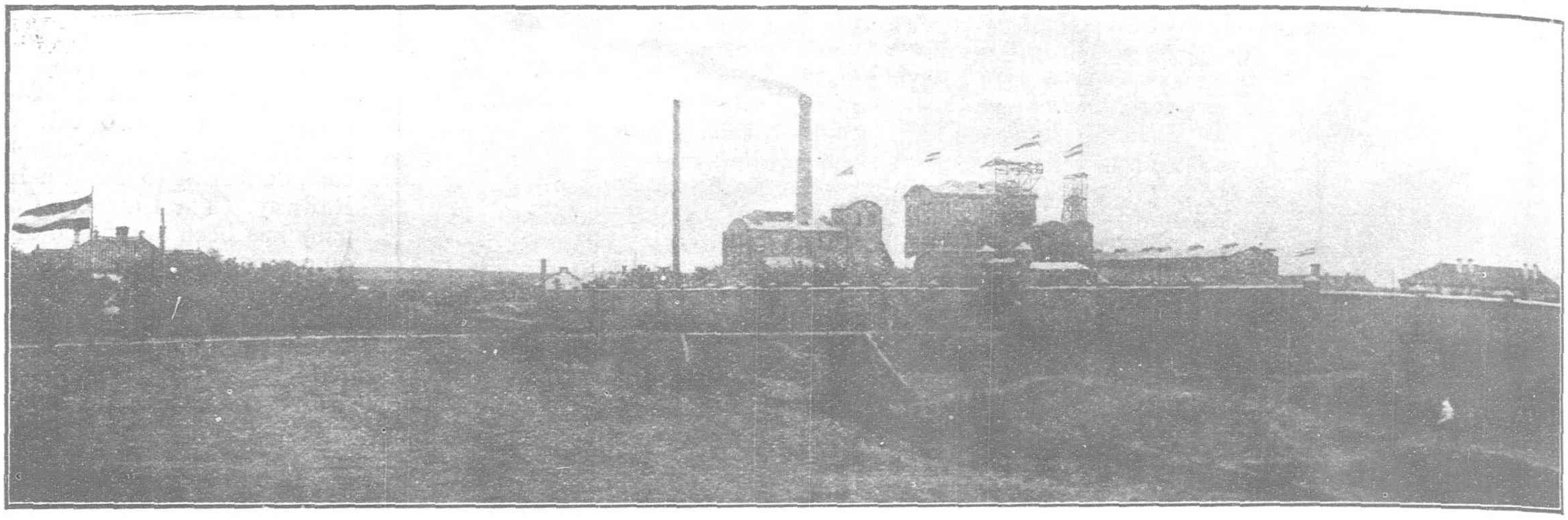
It should be remembered in considering coal shipments in China that the railways are not fully equipped and are not yet efficiently run. Therefore, the longer the railway haul and the larger the tonnage to be handled, the greater the probability of delay. Subject however to these limitations it is clear that China can furnish between 3,000 and 4,000 tons of coal per diem with very small expenditure for preparatory work. With the active co-operation of the Chinese Government railway officials, deliveries could be greatly facilitated and prices might be lowered slightly.

Hides and Skins

Despite the fact that there is not in the whole of China any organized ranch on any scale, or any systematised production of hides and skins, this trade is a large one. The product comes from all over the country from the individual farmer. As with chickens there not being an organized poultry farm in the country—so with cattle, they are mostly kept as side lines by the agriculturists, and the total output is a large one. Organization would effect a tremendous change in the trade, and there is great scope for Government attention. When it is mentioned that the total export of skins undressed, dressed, and made up, during 1916 totaled in value Tls. 26,219,089 some extent of the business



Kailan Mining Administration—The Linsi Colliery



MINES OF THE SHANTUNG MINING COMPANY

under present practically disorganized conditions may be gathered. Cow and buffalo hides sent abroad in 1916 were valued at Tls. 17,581,462. This is a trade which virtually sprang out of war demands. During the Russo-Turkish war military requirements caused the Yangtze Valley to be searched for hides and the export was a large one, though the imperfect methods of curing jeopardised expansion or even continuance for a long time. With the effluxion of time better methods were introduced to permit the skins being transported long distances by sea, but even yet there is room for great improvement. Higher prices could be got if the skins were prepared as they ought to be in China, and there is no need why they should not be, all the essentials being available. If the skins were cleaned, graded, and packed at various points in the country instead of having to be rehandled with this object at Tientsin, Shanghai, and Hongkong the producer would secure the advantage of higher rates.

As it is, large sums are annually lost to the country by the crude, disorganized methods employed. Again in this trade as in most others lack of roads and consequent high cost of transportation, plus the expensive methods of collection throughout the country, send up prices. The goatskins obtainable, and for which there is a great demand (in 1916 about Tls. 6,000,000 were exported) are of an excellent quality. The war has, as in several other cases, given a decided fillip to the trade, prices being advanced at the end of last year by 40 per cent or more above those ruling for the year previous, the chief demand coming from the States, where inability to secure the usual supplies from Russia and India was experienced. Why cannot the whole of this trade be developed and even expanded? The original cause of China coming into the world's market as a source of supply was due to market disturbances in America in 1880. The skins are used mostly for footwear, bookbinding, etc., for rugs, and of late the gray variety from Szechwan and Mongolia have been seen in use in some of the large cities as winter coats for ladies. The Szechwan skin of the first quality has been found to compare with any from South America and South Africa, and even those from Szechwan may be a little inferior to some produced in Shantung and Central China provinces. The chief point of export is Tientsin, with Chungking, Hankow, and Ichang following. In South China the product generally goes to Hongkong, and both in Hongkong, Tientsin, and Shanghai the exporters have to spend much time and labor sorting the pelts for the trade.

The fur trade, too, is worthy of close investigation with an idea of improvement. In 1916 dressed and undressed skins, mostly fox, marmot, raccoon, sable, and weasel to the value of Tls. 1,091,928 were exported.

JAPAN PLANS COAL EMBARGO

Coal will be placed under embargo by the Japanese Government subject to the result of the investigations now conducted in the Department of Agriculture and Commerce, as the price has been raised repeatedly since the war began which is a source of trouble to many lines of industry, not mentioning the trouble experienced by the public. For several weeks some business men representing various commercial bodies have urged the Government to put a ban on the export of coal on the ground that the export is maintained in the face of the stringent turn evidenced in the coal market and is the reason for the advance in the fuel cost. Mr. Sobei Suzuki and other Nagoya business men have personally requested Mr. Nakashoji, Minister of Agriculture and Commerce, to proclaim the desired ban quickly.

The yield of coal in Japan was 22,901,000 tons in 1916 valued at Y80,625,000 in round figures. This was an increase of 11.8 per cent in volume and of 23.9 per cent in value as compared with the preceding year. This year, it is believed by coal men, will see a further increase of 10 per cent to 25,000,000 tons. In spite of this increase in the yield the coal market has been short of stocks since the war began and consumers have been compelled to pay large prices. The causes for this enormous condition are said by coal men to be found in the industrial boom under the war's influences, the increased cost of transportation and the railway congestion. The increase in consumption by industrial men since the war began is very striking and, according to the statement made by the Yamashita Coal Company, it has gone far ahead of the increase in the production of coal. The railway congestion has also been unrelieved for those years and coal has arrived in industrial centres behind time. As to the cost of transportation coal men state that shipowners engaged in the costwise trade have raised their coal rates recently to Y12 per ton against the market price of coal at Y16 per ton. Coal men have raised their own prices, indeed, by 60 to 70 per cent, but the best part of the increased charge has gone to shipowners.

Although, according to coal men, consumers urge the Government to prohibit export in the hope of reducing prices, exports are not responsible for the increase in the cost. The shipments for foreign consigners have fallen off since the war owing to the increased cost of carriage. In 1916 only 3,016,000 tons valued at Y24,105,000 were shipped. This was a decline of 10 per cent. Coal men further remark that even if the Government listens to consumers and effects the prohibition of exportation coal will, therefore, not decline below the present. Moreover, they believe, the ban may not be easily proclaimed, the principal destinations of Japanese exports now being Singapore, Australia, and other points. Some also urge the Government to proclaim a ban on the export of petroleum and machine oil, but it will be some time before this opinion will become a practical question. The principal destinations of Japanese oil is China.

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NEED OF A CONSERVATION COMMISSION IN CHINA

All of Central China and a great deal of the North have experienced this past summer the most destructive floods which have been visited upon the country for a half century. Throughout the spring the most fertile areas in China suffered from an unprecendented drought, which was followed by steady and heavy rains in the Yangtze Valley and the northern provinces. As the hills and plains have been denuded of forests for centuries and as the elaborate dyke and canal systems of previous dynasties have fallen into decay, this steady downpour has been a catastrophe instead of a blessing. In one limited district in Honan alone 14,000 houses were swept away in two days, probably rendering 100,000 people homeless. All the great rivers and lakes overflowed their banks and the muddy water spread over tens of thousands of square miles of land under cultivation in the provinces of Kiangsu, Kiangsi, Hunan, Honan, Anhwei, Shantung, Chihli, Hupeh, and Fengtien. Navigation became dangerous because the usual water courses were obliterated. All the main railway lines were cut by broken bridges and water covered tracks, and the usual overland traffic by cart and packmule became impossible over vast areas. The loss in the rice crop in Hunan alone was estimated at ten millions, and the almost general flood probably affected directly or indirectly the livelihood and trade of a third of China's population.

Conditions this year are unusually severe, but scarcely a year passes without one or another of the flooded areas suffering a more or less costly inundation. The rapid rise and fall of lakes and rivers in China, with the accompanying disasters, can of course be traced directly to the cutting of the forests. The surest solution of the problem of checking this irregularity is therefore wholesale afforestation—much more easily said than put into effect in China for reasons too numerous to mention. The Chinese remedy for the evils accompanying floods and famines is temporary relief and an ill-founded faith that the trouble will not come again until the district affected has had time to recover and recoup. The assistance lent by benevolent foreigners in the past has not been much more effective. The sole policy of the charitably inclined in the past has been to hastily patch up the broken dykes and dig out the filled in drains so that they would suffice to relieve the immediate pressure of the waters and then to feed the hungry populace in a haphazard way for a few weeks until the end of the funds contributed put an abrupt end to the pious work, after which the unfortunates looked out for themselves. Sometimes the Central Government or the provincial authorities remit taxes or set aside special appropriations for relief work, and entrust the spending of these funds to the local officials who almost invariably go about their duties without system and without scientific guidance, giving out food here and there, doing a little digging here and there, spending as much of the money as they see fit and retaining as much as they see fit and giving no clear account of it all except to announce with finality after a time that the funds are exhausted. Matters are not much better under the management of guilds and Chinese charitable organizations. Whatever the remedy applied, it is essentially local and temporary. There is in the Ministry of Agriculture and Commerce in Peking a Conservancy Bureau which has employed from time to time some very capable and earnest men, but which has been circumscribed at all times by a shortage of funds and lack of strong support.

The widespread character of the floods this year has impressed upon the Chinese Government, but more especially upon the Chinese commerical people, who share the cost of such disasters with the country folk, the need of organization and has bred throughout China a general dissatisfaction with the Chinese methods of dealing with such natural disasters. It is generally realized that in ancient times China had reason to be proud of her public works and that in this generation she has particular reason to be ashamed of them. There have been particular measures of relief taken in the various afflicted areas that are yet futile in proportion to the damage and suffering caused, and it is only too apparent that in most districts the measures of prevention are nothing but puerile make believe. The need of organization and efficient action have been keenly felt. Not only Chinese merchants but foreign merchants as well have felt the effect of the destruction of crops and property and the serious interruption of transportation in so many rich districts. The Chinese have been loud in their complaints and from the foreigners, particularly from Shanghai merchants of influence and standing, have come practical suggestions and offers of assistance on the condition that their suggestions are followed by the Chinese.

It is apparent to any one who has studied flood conditions that a central organization directing practical relief work which will at the same time be work of prevention, is badly needed. The Chinese who are charitably inclined give liberally towards the relief of those who are left homeless and starving by floods and famine. The merchants give with equal liberality in their local communities when it is apparent that their money will be used in practical work, which will not only give present relief but will serve as an insurance against repetitions of these costly cataclysms. There is no class in China that would not give in some degree to work that would be at once charitable and which would give evidence at every stroke of its preventive virtues and at the same time there is no class which would entrust funds blindly to the official class for unchecked expenditure in any line of work.

The conclusion of the foreigners who are keenly interested, and of whose interests the Chinese should make the most in this season, is that a central organization should be established in China to supervise all conservancy work, which would have the approval and support of the Central Government, but which would be independent of it and which would be of such a character that foreigners could not only contribute to it but participate in its direction. Two departments should be particularly prominent—the engineering department and the accounting department, the first to make apparent the practical character of the work, and the second to give a prompt account of the expenditure of every copper. On no other basis could such an organization count upon the support of either Chinese or foreign merchants, who are practical folk and are not moved sentimentally to turn over large sums of money upon which they see no return.

There are two Chinese ministries which should be directly interested, the Ministry of the Interior and the Ministry of Agriculture and Commerce. The United Chinese Chambers of Commerce should be enlisted and also the foreign Chambers of Commerce. In addition to these, every charitable organization, mission body, and guild which is known to do relief work should be enlisted and should be represented by a director, resident in Peking. This semi-official organization, whether a society or an adjunct of the Government, should then be empowered by the government to take over conservancy work wherever emergency required, and every piece of work should give the flood victims ample means of earning a living by their labour and at the same time carry out constructive preventive engineering which would ensure the district against future disasters. The society or commission should employ competent engineers and should be supported by subscriptions from all the bodies or individuals represented. In every instance where the Commission found it necessary to do work the provincial authorities should be instructed to turn over not only the direction of relief work but the funds locally raised to the Commission's agents and to give facilities for the prosecution of the work whether charitable or constructive. On all such works the Conservancy Bureau should have a representative so that the work of the commission and the work of the Bureau would not conflict but would be complementary. A similar arrangement for the Bureau's participation in the councils of the Central Commission would be essential to the effective carrying out of the Government's own conservancy work and of the work of the Commission.

Both the Chinese Government and the foreign merchants are at present interested in the organization of such a Commission, and a review of the possibilities of centrally organized relief and constructive work, as tehy were first prompted by the head of one of the largest foreign firms in China and set forth in the "Peking Evening Times" have aroused the interest of the Ministries of the Interior and of Communications. The need of such work to direct the spasmodic efforts which are made to check floods and relieve the consequent suffering and in which millions are wasted in well meant but futile expenditure, has never been so apparent as it has been this year.

In view of the need which is felt among all classes of China to make some tangible contribution towards the successful prosecution of the Great War in which China is now a participant, the proposed control of conservancy work by an efficient commission takes on additional importance. A famine-stricken, impoverished China can do very little, materially, to assist the Allies. A China with a vast area of rich land secured against flood and drought, and a still greater area recovered from the low lying danger zones which the farmers perennially avoid, could produce a food surplus, a surplus in cereals, which might easily be made a real asset to the Allies.

There is in China an embargo upon cereals, but as China is now self-supporting there would probably be little difficulty in persuading the Chinese Government to permit for the period of the war the export to Europe of all the surplus crops of areas reclaimed whether in the flooded districts of the south or the arid grass lands of the north, if the reclamation were carried on with the co-operation of the various foreign organizations in China which are now interested almost equally in war work and in the relief and prevention of flood conditions in China.

CHINA'S FINANCIAL GAINS

The nations interested in the Boxer Indemnity who are at war with Germany and Austria have, with the exception of Russia, agreed to the postponement of the amount due by China for a period of five years. Russia has agreed to remit one third of the amount due to her. The total fine imposed upon China for the outrage of 1900 was Taels 450,000,000 to be paid up by 1940. China thus gains the use of some £16,449,600 sterling for five years and has the hope that the total amount may be remitted by and by. Whether the postponement will be an actual gain at this time is questionable since exchange is so tremendously in China's favor. It will be a distinct advantage if the interested Powers eventually make a present of the amount to China, as they ought to, but if the payments have to be made later when exchange will have become normal, then China will have lost just what she could have saved by taking advantage of the high price of silver in the war period. She will, however, benefit by the total amount due to Germany and Austria, which was cancelled when she declared war and thus abrogated treaties with those countries. In her coffers will remain some £772,320 annually, an actual advantage of some millions of pounds. A more distinct gain, perhaps, is the agreement of the Allied Powers to permit China to raise her Customs dues to an effective five per cent. As the present schedule of duties was compiled on the basis of prices ruling in 1902 insofar as imports are concerned and in 1858 in the case of exports the present revenues should be almost doubled. A Commission will shortly sit to tackle this question, and in the meantime the only nation who is raising a hue and cry is the Japanese. In present circumstances the cotton spinners of Japan are receiving Tls. eda healthy and substantial advancing at the expense of China in the matter will now be cleared up. Why Japanese industries should be spoon-fed at the expense of those in China it is difficult to comprehend, and if justice is to be done by those who are fighting for justice in this very wicked world, then steps should be taken to put the Japanese spinners, who have profited for many years, in their place.

STEEL THE BACKBONE OF A COUNTRY

Japanese war profits have bid fair to become proverbial. The country has grown rich over night, and Narekin, as our neighbors call the new rich, have become so numerous that strangers hesitate to walk abroad for fear of stepping on one and hurting somebody's feelings. In the past two years especially the war has brought to the Island Empire many commercial opportunities which have been turned to account with excellent judgment and results. New industries have arisen and old ones expanded at an unprecedented rate and the flow of gold toward Japan is now in such current as to furnish a new problem to international financiers. It is a repetition on a smaller scale of what happened in America before the United States joined in the war. While the actual profit to Japan has been smaller than to the United States, it has been proportionately as large and it has been more than ample to set in motion numerous new currents of trade and industry. In no field has the growth been more striking than in shipping. The Japanese merchant marine has increased by leaps and bounds. As new needs have developed or the ships of other nations were withdrawn, Japanese vessels have appeared in increasing numbers on the various trade routes. Especially on the Pacific have Japanese ships swarmed. To supply vessels for the enlarged merchant marine it has been necessary to increase the capacity of the local ship yards to correspond. Not only have old yards been expanded, but new ones have been built until their number and names become hard to remember. In pre-war days Japan could build 150,000 to 200,000 tons of ships per year. The present capacity of Japanese ship yards is estimated at 900,000 to 1,000,000 tons, and the business has proved extremely profitable. Aside from the ships needed by the Japanese themselves, the yards have done a good business in building for other nations, notably Norway. It has repeatedly happened that a ship has been sold and resold several times before it took the water. All this is of course only a repetition of what is happening in other countries prepared to build ships and free to dispose of them. Before the United States went to war and commandeered all ships being built, American ship yards were enjoying equal prosperity. America's entry into the war changed matters radically for American ship-builders and seems likely to make a considerable difference to the Japanese.

Japan's steel production has not grown as rapidly as has its manufacturing industries and even in pre-war days Japan was dependent upon others for the larger part of the steel used. After Great Britain went to war, export of steel and various other materials except on especial license, was forbidden. This was done partly to insure that none of the materials should reach the enemy and partly to make sure that adequate supplies for all war uses remained within the Empire. This move resulted in real hardship in all parts of the world. Mining companies which had contracted in England for machinery were subjected to indefinite delay and in instances were forced to duplicate their orders elsewhere. The American rubber industries were temporarily threatened with extinction since Great Britain would not even allow shipment of rubber already bought and paid for. In time all these difficulties were adjusted though not always to the satisfaction of everybody concerned.

At that time Japanese manufacturers as well as others were incommoded, but so long as the American market remained open and prices of finished goods continued to rise the matter was not serious. Now America in turn has forbidden export, except upon license and for war work, of many raw materials and Japan is in real difficulty especially as regards steel. To build ships of 1,000,000 tons capacity requires about half that much steel and this is not far from the total amount of steel made in Japan. To keep the ship yards going, even assuming that all the steel made could be converted to ship uses, would require stopping all other steel using industries. But not all the steel made can be used for ship making as not all of it is adapted to that purpose and a works run only to make ship plates would not be in economic balance. Japan, too, needs steel for making guns, armour plate, rails, cars, locomotives, automobiles, tools, and all the thousand and one things that enter into modern daily life. Steel must be had or industry will slow down and this illustrates how a country that does not command its own raw materials cannot be independent. If Japan cannot now continue what is practically a peace program of building because of lack of steel, it is clear that it would not be able to wage any long or aggressive war against the wishes of the other leading nations. Without any unfriendly intent, apparently without even any serious consideration of how the action would affect Japan, the United States has without firing a shot reduced Japan to the point of negotiations. So a special commission has been sent to America, meetings are being held, leagues formed, and pressure is being brought to bear on Washington through diplomatic channels and on New York through business circles, all to the end that Japan be given more steel. Doubtless some arrangement will be made because there is no reason to suppose that America purposed any unfriendly act, the Washington authorities merely looking first to America's own war needs.

The incident is chiefly interesting to Chinese in that it shows how very important it is for a country to command its own resources of iron and steel both for peace and war. Only so can it be truly independent. It is possible to fight a short sharp campaign with material accumulated in advance, but against a country or a league of countries that refuses to consider the decision of such a campaign final, it is only possible to win by organizing production on a scale commensurate to the armies involved. Continuous supplies of shell and ships are as essential as a steady flow of recruits.

It is but natural that Japanese should have thought of all this and that they should be working toward independence in steel production. In 1914 the output of pig iron, which is the basis of steel making, was 299,139 tons. In 1915 this became 313,558 and 1916 389,647. It is estimated that for 1917 it will exceed 570,000 tons. The steel production is slightly larger since addition of scrap iron and the import of pig iron more than offsets the use of iron for foundry purposes. The largest part of the output comes from the Imperial Steel Works at Wakamatsu now estimated to have an annual capacity of 450,000 tons. Most of this is required for Government work in various forms, either for use of the navy, army, the railways, or other civil departments. The Kamaishi Iron Works yields about 70,000 tons and the Okura enterprises including the blast furnaces at Penshihu in Manchuria, can perhaps furnish now, or soon, as much as 100,000 tons per year. Most Japanese works, however, are small and in the dozen or more new plants or extensions that are in a more or less advanced state, the largest is the Oriental Steel Co., just organized to use iron from the Taochung deposits on the Yangtze. This company plans ultimately, according to newsaper report, to make 600,000 tons of pig iron per year. The Japanese foresee a time when they will control a total output of 3,000,000 tons of steel, but if their wants continue to increase as they have in the past, even this multiplication by six of their present output will prove inadequate. It is unfortunate that the iron deposits in Japan are relatively small. Those in Korea are also much below Japanese needs, and therefore at the very forefront of Japanese demands on China have been those relating to iron ore. It will be remembered that in the famous twenty-one demands China was asked not only to grant the Japanese important deposits in Manchuria, Shantung, and the Yangtze valley, but to agree not to permit any enterprise to compete with the Hanyang Works after they had passed under Japanese control. China gave the deposits asked, but saved out of the wreck the right to build competing Chinese works, if it proved desirable. Of the total known iron ore resources of China a larger tonnage has already been granted to Japanese alone than the Government retains, taking no account of the ore which is held by Chinese companies and individuals, which is less than either that owned by the Japanese or the Chinese Government. It is also interesting to note that. assuming Japanese make good their claim to the German rights at Chinglingchen, there is not an important workable iron deposit in China now held by any foreigners except Japanese. The Kailan Mining Administration through its Chinese branch, the Lanchow Mining Company, has some rather indefinite rights that may become important, and the Peking Syndicate has rights in Honan, but their value is highly problematical.

All this is highly satisfactory to the Japanese and no one can quarrel with them for protecting their own interests in a matter which as we have just seen is so important to them, but how about China's interest? Does not China need to look to her own future? The total amount of iron available in China is, as we have previously written, much smaller than has been supposed and if the Government holds all the ore to which it now has title it will still have resources barely equal to those of the Japanese in China alone. The experience that Japan is now going through is another strong argument for nationalization of Chinese iron.

UNITED STATES WOULD WELCOME CHINESE LABOUR—AND WOULD NOT

The food shortage in the United States is becoming such a grave problem, not so much on account of the surplus for feeding the population, but as regards the surplus to help feed the Allies, and this being coupled with the withdrawal of many hundred thousand men from the fields into training camps, has raised the question "What shall we do?" The only solution that has been offered is the admission of Chinese, who have been barred from the United States ever since the rioters in San Francisco gained the upper hand and declared that the Chinese must go.

The United States is not at all unanimous about the admission of Chinese, and it is to be noted that while the eastern states and those of the middle west, and especially the great wheat growing states of the country west of the Mississippi River where the labor shortage at harvest time has been growing more and more severe each year, are ready to welcome the Chinese with extended hands, and permit him to live in his own peculiar way if they can only bring him in as a solution of their problem, on the Pacific Coast the experience of the ranchers and farmers with Japanese emigrants has not led them to look kindly upon any class of Oriental emigrant. In fact the ban that was originally placed only on the Chinese would be made to bear even more harshly upon the Japanese and East Indian, the latter, however, being an undesirable not only for racial reasons, but because he has proved almost worthless as a laborer. Such being the state of affairs, the United States is again split on the subject of Oriental labor, the dividing line being the Rocky Mountains. Whether the eastern and middle west farmers will be able to induce Congress to modify the Chinese exclusion act so that labor may be permitted to come in for a definite period, later to be deported, remains to be seen, but there is no question that the opposition from the Pacific Coast will be as strong or stronger than in the days of the San Francisco riots.

ONWARD—GLYCINE HISPIDA

There once was a little boy from Boston, where they use big words from infancy, who returned from a visit to his country cousin and said to his mother: "My cousin says I don't know beans. Don't you suppose, mother, that he realizes that the study of the leguminosae is that of a lifetime?"

The farmers of the United States probably thought they "knew beans" until a new luminary appeared in the galaxy of that humble vegetable. Last year or the year before some rustic inhabitant of the corn belt, that ill-defined stretch of country between the headwaters of the Ohio and the back counties of Iowa, heard of a new kind of bean which was being crushed by oil millers on the Pacific Coast. These millers also tried to sell the farmers of the middle west a new fertilizer called bean cake, and it worked mighty well considering that it was an untried substance in the fertilization field. The fact that a bean could be produced and run through a mill in order that its dry bones might be sold so cheaply rather startled the corn belt farmer and he began to deluge the Department of Agriculture in Washington with inquiries as to the possibilities of this soya bean, as it was called.

The Department met his request with alacrity and considerable joy, since it had been trying as hard as it could for the last ten years to have the soya bean grown in the United States as a soil enriching crop that would yield as big a profit as any other that could be grown. Only it happens that the proverbial fly has shown up in the farmer's pomatum. In this instance the drawback is the fact that a democratic congress has put soya beans, oil and bean cake on the free list, and he would indeed be a brave farmer who would start in to cultivate or rather experiment with a crop that was not given at least some small protection against foreign competition in the shape of a tariff. This time it is the farmer who is raising the cry for protection on infant industries, the infant in question being the growing of soya beans. There is little doubt but that the production with or without protection of soya beans will come to importance as an agricultural product in the United States. It may take a little longer if no protection is given, but the mere fact that more than 45,000,000 pounds of oil cake were imported in 1916 largely from Japan, and used as fertilizer on American fields, has given rise to the thought in the mind of the farmer as to whether it would pay him to grow his own raw material in this particular case.

At any rate, the soya bean which had scarcely been heard of before the South Manchuria Railway opened up enormous tracts of fertile lands to farmers, has prepared to leap the Pacific Ocean and find a new and, let us hope, prosperous habitat in the United States.

FORMOSA TEA FREIGHT TANGLE

American and British tea interests, dealing in Formosa tea, are much concerned about their inability to secure adequate freight space for shipment from Formosa. It is reported, says the Tea and Coffee Trade Journal, that for some time past shippers have been discriminated against by the Japanese steamship companies to the advantage of Mitsui & Co., which is said to be in a fair way to monopolize the Formosa tea business.

There are two large steamship companies carrying tea between Formosa and the United States, the Nippon Yusen Kaisha and the Osaka Shosen Kaisha. In addition to the ships operated by these companies there are also a few making irregular sailings from Formosa. It is claimed that Mitsui & Co. practically control the allotment of freight space on both the N. Y. K. and O. S. K., and that American tea shippers are not receiving their just apportionment. Owing to the lack of British and American bottoms, due to the war, the American and British shippers are practically dependent upon Japanese steamship companies.

In an effort to correct the situation, two meetings attended by the American and British tea interests, representatives of the Japanese steamship companies and Mitsui & Co., as well as the American and British Consuls, were held at Taipeh, Formosa, the first meeting on June 8 and the second on June 13. According to the report of the latter meeting, Max D. Kirjassoff, American Consul at Taipeh, stated that the steamship companies are engaged in a conspiracy against foreign shippers, and that certain American tea importers claim to have proof that Mitsui & Co.'s representatives in New York "have openly boasted that they only would be able to get their teas to America this season." Mr. Kirjassoff also stated that American tea buyers suspected that Mitsui & Co. were being helped by the Japanese Government. In reply to this accusation, Mr. Nagai, of Mitsui & Co., stated that his concern intended no injury to foreign trade and that competition was open.

It was proposed at this meeting that Mitsui & Co. be allowed not more than 50 per cent of the space on any one ship of the N. Y. K., the balance to be divided among the seven remaining tea shippers on a carload basis. As regards the ships of all other lines, it was proposed that of the first 280 tons available, each of the eight companies be given 35 tons, or one carload, the balance to be divided on the pro-rata percentage basis of 1916 shipments. Mitsui & Co.'s representative tentatively agreed to this proposition, but suggested that the allotment of space on the O. S. K. liners be on the basis of last year's shipments by this line.

Later advices from Taipeh state that further meetings have been held and another agreement entered into, whereby Mitsui & Co. were to secure 50 per cent of all available space on the Japanese ships, the balance to be divided pro rata among the other shippers on the basis of their shipments during the past 3 years.

PHILIPPINE FOREIGN TRADE IN THE CALENDAR YEAR 1916

From Philippine customs returns received and compiled by the Bureau of Insular Affairs for the calendar year 1916 it appears that war conditions and high prices were ruling factors in a depressed import trade that reached the lowest figure since the inauguration of free trade with the United States in 1909, and in an increase in exports to the highest value by far in the history of the islands.

Under advancing freights, growing transportation difficulties, and soaring prices due to urgent stress of war demands in the world markets, import activity was restricted, and an actual decline of approximately four million dollars in value as compared with 1915, very inadequately expresses the actual shrinkage in the volume of imports for the year, in view of the general advance in prices. On the other hand, high prices in the export trade stimulated production, led to larger output in most of the important staples, and resulted in a total export value of approximately seventy million dollars*,—an increase of sixteen million over 1915 and an unprecedented trade balance of about twenty-five million dollars over the import total for the year.

The reduced import trade is subject to a further discount, in view of a marked development in foreign exports during 1916. The Philippines as a distributing center for foreign goods heretofore figured at the most to the extent of about half a million dollars, but in the past year this increased to more than a million and a half. While this larger total followed the general distribution of previous years and was chiefly with neighboring oriental countries, Russia was a new destination of considerable importance in this trade, as well as in domestic exports, coincident with the great war-trade development of the port of Vladivostock. In the wide range of articles comprised in foreign exports for the year, American chemicals assumed considerable importance and serve to explain, in a measure, the larger chemical trade of 1916.

There was a very general decline in imports of foodstuffs, due in great part to an active "food-production campaign" by the insular Bureau of Agriculture, begun in 1914. The rice crop fell short of earlier anticipations, and though the quantity imported was somewhat below the high figure of 1915, higher prices prevailed, and the reduction in value was not material. With the continuance of war prices in wheat, the flour trade was the smallest since 1909. Australian flour, which, in consequence of the drought, practically abandoned the market to American in 1915, reappeared to the amount of about a quarter of million dollars in the million and a half total.

Imports of meat and dairy products materially declined. The quantity of fresh beef was reduced nearly half, and though still chiefly from Australia, the new China coast supply was a close second and taking the lead toward the end of the year. The cattle trade, which supplements imports of refrigerated beef, declined also, to less than half the unusually high figure reached in 1915. Australian cattle, which prior to the war dominated the market, virtually disappeared, and there were no imports from Australia after January, while freights favored the near-by Asiatic sources that supplied the reduced trade of the year.

Imports of animal foodstuffs were also much reduced, and though no doubt the freight situation operated to this end on such commodities as hay, bran, and oats, there is also to be considered the "food-production campaign" and the greatly stimulated production of corn. A further factor in the animal food supply is found in the growing output of coconut cake, the by-product of the new coconut oil industry, which has been the subject of local advertising propaganda during the year. The stock-food value of this article has been long appreciated by Europe, and there were exports of some importance to Germany prior to the war. Since then there has been practically no foreign market, except for minor shipments in the closing months of 1916, and a fortunate outcome alike to producer and consumer is to be seen in force of circumstances serving to introduce the use of this valuable domestic product.

Imports of cotton textiles declined from over eight and a half million dollars to six million, —the lowest figure in many years. But the decline is qualified in a measure by the trade of 1915 having been the largest ever recorded, and heavy stocking-up at the more favorable prices prevailing in that year represents a definite gain. The reduced total was chiefly at the expense of American textiles, which during the war have increasingly dominated the market and constituted over eighty per cent of the value of this trade in 1916. British fabrics, which, prior to free trade with the United States controlled the market, continued the steady decline of previous years and constituted only about ten per cent of the total. Cotton yarns shared the experience of textiles, showing higher prices and reduced quantities, which reached an exceptionally low figure and were as heretofore chiefly from Japan.

Iron and steel attained a maximum of over eight and a half million dollars in 1913, and some measure of the arrested industrial development of the islands during the war may be gathered from the steady yearly decline until a value of less than four million was reached in 1916, though even this fails to give the full measure of the situation in view of the marked advance in the price of these materials. The legislature provided for the erection of a government-aided sugar central, but the increased cost of materials and transportation, and the difficulties in securing a satisfactory contract and guaranty of delivery led to postponement of the plan, and doubtless this experience of the government was also generally true in the reduced private activity, as indicated in the iron and steel total for the year.

The automobile trade showed marked development. There was a fifty per cent increase in the number imported, and though the year was characterized by the usual condition of declining average price due to cheapening production and the increase in lower grade machines, the aggregate value was materially larger than that of 1915, and there was also a marked increase in parts and equipment. Manila, as an oriental distributing point for the American auto trade, is indicated in exports of some importance of American machines to near-by countries. The growing use of the auto in the islands is evidenced by a fifty per cent increase in the quantity of gasoline imported, which continued to be chiefly American supplemented to a minor extent by the product of the Dutch East Indies.

In the distribution of the reduced import trade by countries, American goods chiefly suffered. Imports from the United States were three and a half million dollars below those of 1915, and constituted fifty per cent of all imports against fifty-three per cent in the previous year. In this decline American textiles previously referred to were the conspicuous factor. The Australian total was adversely affected by losses in the beef and cattle trade as well as by the practically complete withdrawal during the year of the formerly important Australian coal trade in favor of the Japanese product. Japan continued to profit by the favorable conditions created by the war for the supply of the islands' needs, and conspicuously led among the few important countries showing increased totals. The doubling of import values credited to the Dutch East Indies was due chiefly to mineral oils and to unusually heavy purchases in the quinine trade that were later distributed as foreign exports.

In the sixteen million dollar increase in the export total of 1916, sugar and hemp were the chief contributors, the former due mainly to large production and the latter to exceptional prices, but higher prices as well as increased quantities and notably larger values were a very general feature throughout the various classes of exports, with the notable exception of copra.

The effect of the typhoons of the latter part of 1915 was manifest in the quantity of copra exported in 1916, which was only little more than half that of the previous year and the smallest since 1907. Though prices showed a marked recovery from the depression of the earlier period of the war, the net result was a four million dollar drop in value as compared with 1915. A striking feature of the year's returns was the lead taken by the United States, with purchases of about half of the reduced total, while France, the leading consumer heretofore, figured only to a minor extent and for several months in the earlier part of the year disappeared entirely from the trade. The reduced exports of copra are explained to a slight extent by the increasing local production of coconut oil, the larger output for the year having been marketed at a higher price and to a value of approximately four million dollars. This distinctly American trade met with some competition from Russia in the latter part of the year.

Sugar production in 1916 broke all previous records in the history of the islands,—exports amounting to 332,158 long tons, exceeding by seventy-five thousand tons the previous high record of the islands established during the Spanish régime, and being a hundred and twenty-four thousand tons above the exports of 1915. The high average price of that year was slightly increased, and a larger value by seven million dollars to the credit of the sugar trade shows the highly favorable condition of that industry during 1916 under war prices and record-breaking production. Though there were larger shipments to both the American and oriental markets, freight rates and the heavy Cuban production continued unfavorable to the taking by the United States of the large proportion of the crop that was a feature of earlier years of free trade, and greatly increased British purchases, which amounted to about twenty per cent of the total, furnished the most conspicuous feature in the distribution of the year's total. Centrifugal and high-grade sugars, the product of recent mill installations, are beginning to assume considerable importance in the trade, and to this may be attributed a further reduction in imports of refined sugar.

The effect of typhoons in the hemp districts in the latter part of 1915, while not so serious as originally anticipated, was manifest in a slight reduction in the quantity of hemp exported in 1916, but advancing prices and an average for the year beyond all previous experience, resulted in an increase of over five million dollars in this trade, with an annual value much in excess of any heretofore recorded. The American and British markets continued to absorb the great bulk of the output, with no very marked change in distribution from that of the previous year. Maguey also profited by the favorable conditions in the fiber market of 1916, with even a more striking price increase than that of hemp, while the quantity exported was double that of any previous year. This minor fiber of the Philippines found increased favor in the American market, and exports to the United States took the lead in a trade heretofore distinctly British.

The reduced leaf tobacco shipments of 1915 showed a sixty per cent increase in quantity

(Continued on Page 716)

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* U.S. Currency.

PHILIPPINE DISTILLERY OF MODERN TYPE IN NIPA PALM DISTRICT

THE ALCOHOL INDUSTRY OF THE TROPICS

[BY THE PHILIPPINE BUREAU OF SCIENCE]

Alcohol will be used much more in the future as a source of power than at present. While the application of new methods of cracking the heavier earth oils may help to keep the price of gasoline for a time at a point where its use is more economical than that of alcohol, yet the time inevitably approaches when alcohol and gasoline will sell at relative prices that will make it impossible for gasoline so nearly to monopolize the market as it does at the present time. Unless new fields are discovered that are as productive as those of the Pennsylvania oil region, this period of competition is much nearer than many realize.

When this time arrives, the tropical and semitropical countries are bound to assume an enhanced importance because of the advantages they enjoy in the possession of cheap sources of alcohol. Three of the cheapest sources of alcohol occur in the tropical countries—namely, sugar from sugar cane, tuba from the nipa palm and possibly from the coconut palm, and starch from the starch plants. In a recent address General Gorgas, U. S. A., made the statement that the Amazon and Kongo regions, if under intensive cultivation, could produce as much food as is at present consumed by the whole world. All they need is the stimulus and the preparation. The tropical regions are certain to assume an important position in the food production of the world. The fact that they have a growing period of twelve months a year while temperate zones have not more than five gives the tropics an advantage not always sufficiently considered. The Philippine Islands, lying in the tropical zone, possess this advantage; but they too are backward in the development of their agricultural resources.

COCONUT TREE SAP GATHERER ON BAMBOO RUNWAY

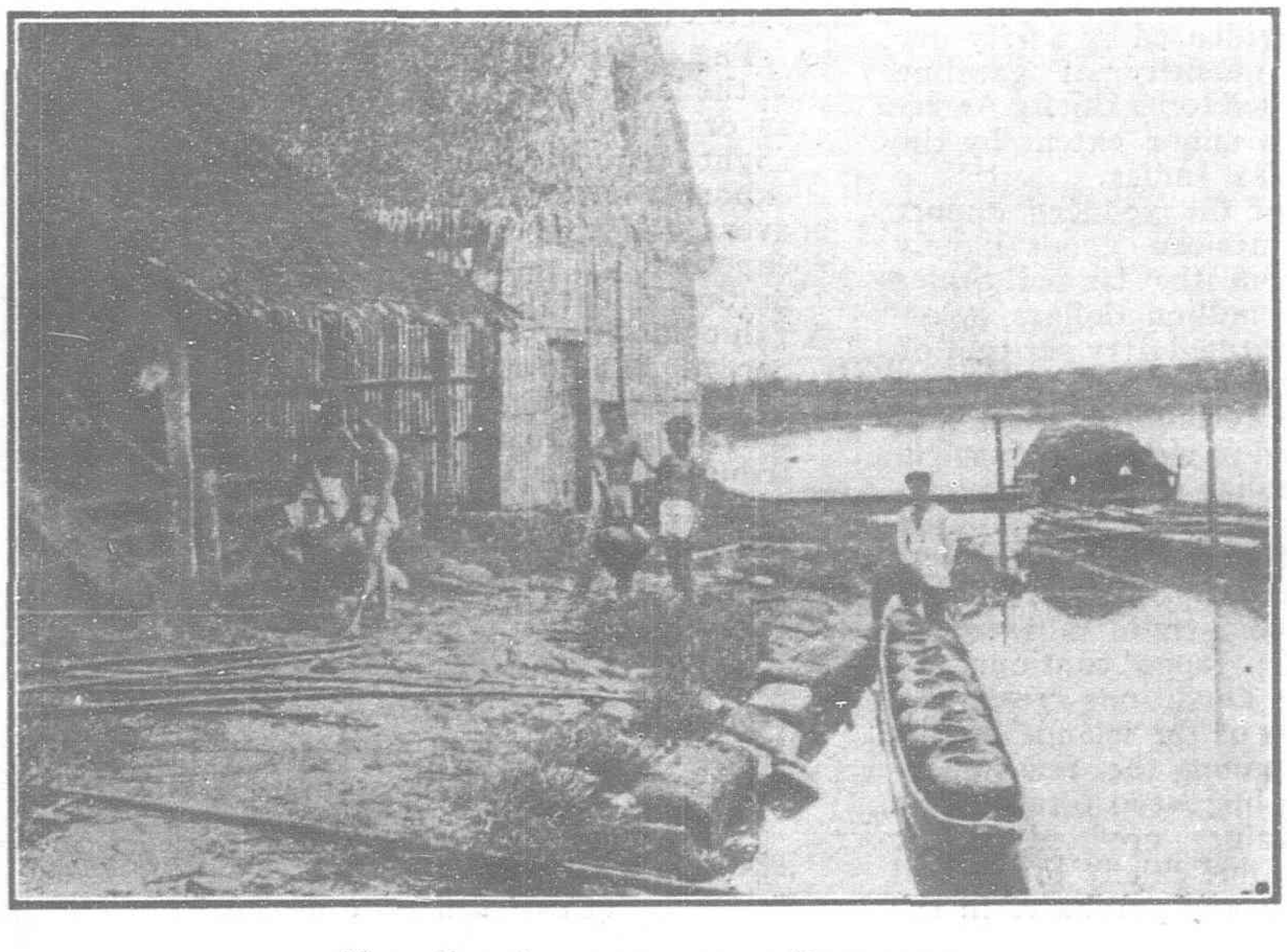
Much of the sugar produced in the Philippine Islands is of the muscavado type, and this is either sold in the Orient or shipped to the refinery. Such sugar produces no molasses that could be used for the production of alcohol and also sells at a lower price than does centrifugal sugar; consequently the planters' loss arises from two sources. On the other hand, much of the molasses produced in a centrifugal mill is not utilized, but is allowed to run into the ditch.

There are several uses for this discard molasses:

1. It may be used as a cattle food. To be profitable for this purpose, freight rates must be low, if it is to be shipped any distance, or the cattle must be reared in the vicinity. At present freight rates are practically prohibitive, making it unprofitable to transport the molasses any great distance. Cattle in the Philippine Islands are not plentiful, owing to the presence of rinderpest. The molasses cannot be profitably utilized here for this purpose.

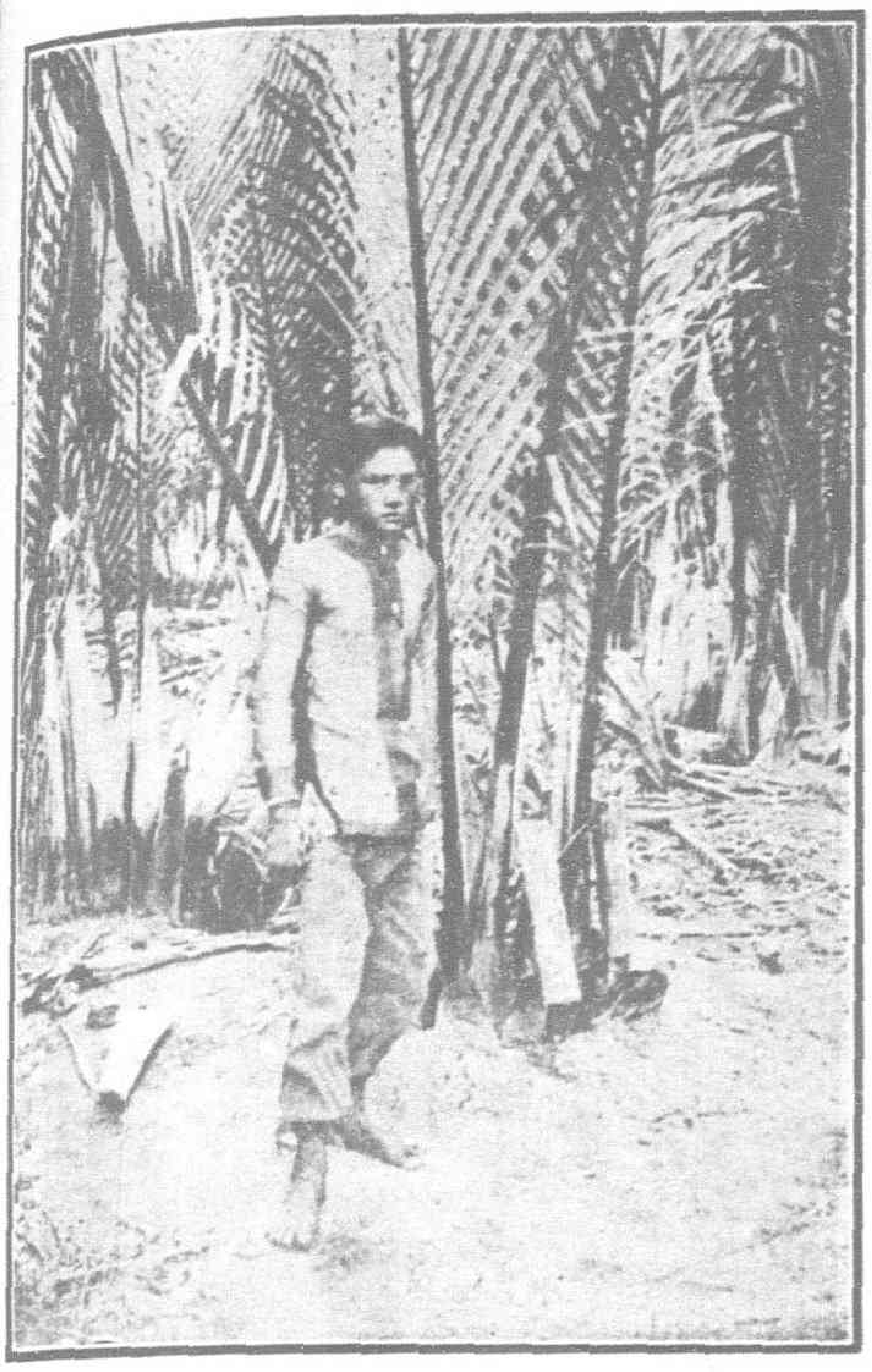
2. Some experimental work has been done on the use of molasses in paving bricks. This is still in the experimental stage, so that nothing can be predicted concerning its use in this manner.

3. As a binder for briquets molasses served admirably, but no large quantities could be used in this way and, besides, the question of freight rates would again be involved. Then, too, the large quantities of coal dust heretofore available for this purpose will be consumed in



NIPA SAP ARRIVING AT THE DISTILLERY

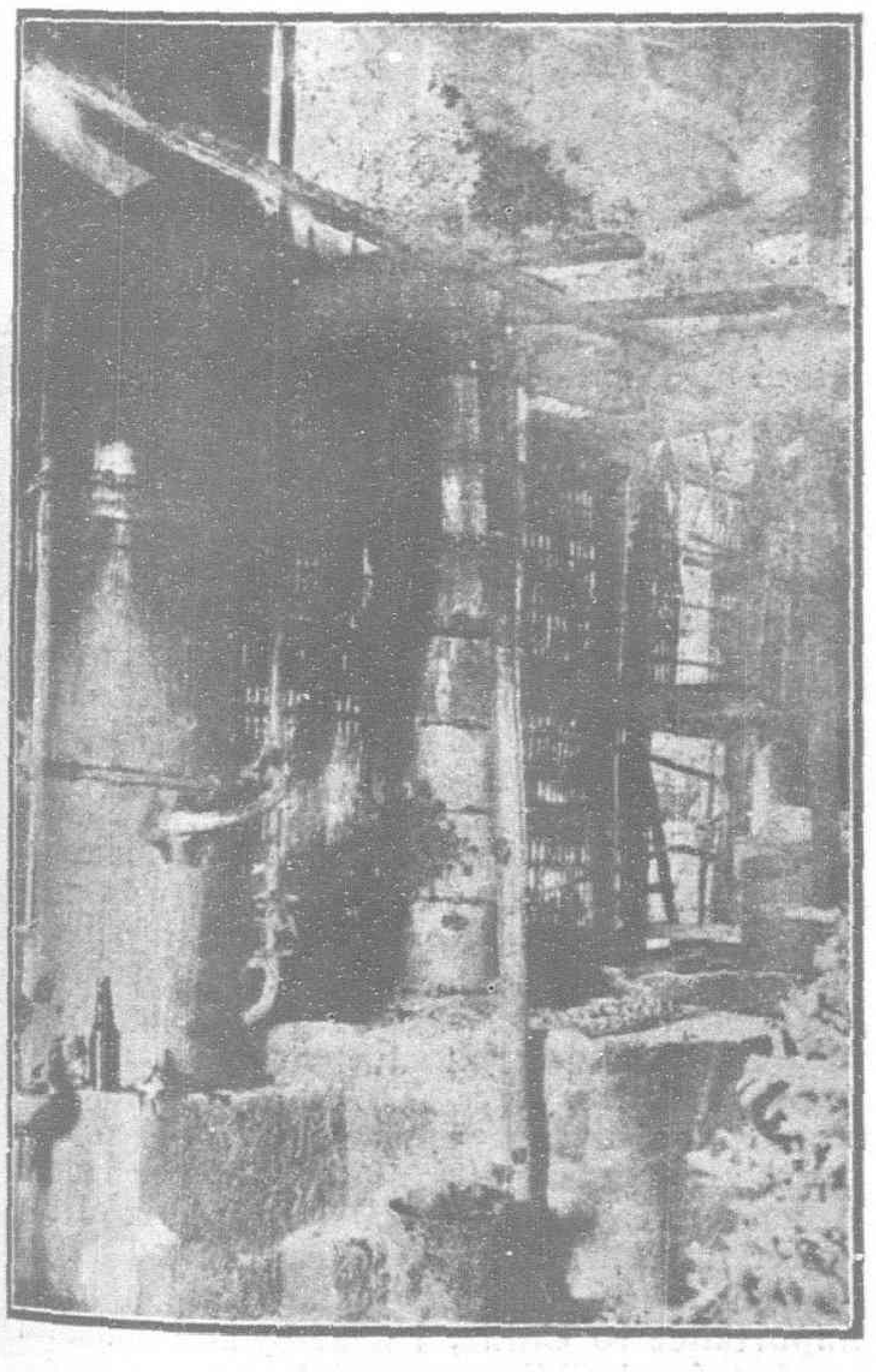
NIPA SWAMP, SHOWING WATERWAY



Nipa Sap Gatherer

a different manner in the future. The Chicago and Northwestern Railway is using coal dust instead of lump coal on one of its engines and finds the efficiency greater from the consumption of the dust than from the same weight of lump coal. The Bureau of Science hopes to utilize Philippine coal in this manner.

4. The effect of molasses as a fertilizer has been investigated. At one time great hopes were held for it in this field, as it was found that glucose had a stimulative action on the bacteria that bind the nitrogen of the air into compounds. These bacteria are distinct from those growing on the legumes. However, this optimistic anticipation was not realized, since sugar also stimulates the activity of the group of bacteria that tear down the nitrogen compounds. The phosphate, potash, and nitrogen compounds that are present in the molasses are useful for fertilizer, but the application of the molasses would entail the loss of too much sugar.



orms of Column Stills Used for Nipa Distillation

5. Molasses is used in some places for fuel, but it can be burned only under careful control, as it glazes on the walls of the furnace and proves troublesome on this account. The sugar cane industry is peculiar in that the product, sugar, takes nothing from the soil that is necessary for the growth of the plant. If the ash from the bagasse and the mineral constituents of the discard molasses are returned to the soil, the soil is theoretically as capable of producing another crop as it was of producing the preceding one.

6. However, the most profitable utilization of the discard molasses is to convert it into alcohol and to recover the fertilizing ingredients from the lees.

Discard molasses sells in the Philippine Islands at 3 cents a gallon or about $5.50 a long ton. The average total sugar as glucose of this molasses is 62 per cent; that is, a long ton of molasses contains 620 kilograms of sugar. Theoretically 100 parts of sugar should give 51.1 parts of alcohol, but in practice about 80 per cent of the theoretical is considered good. From 1 ton of molasses a yield of 316 liters of absolute, or about 540 liters of 182 proof, alcohol should be obtained. At the present time such alcohol sells in Manila at 17.2 centavos (8.6 cents) a liter. The alcohol from a ton of molasses would represent a value of P58,48 ($29.74). The lees have a value as a fertilizer, since they contain nitrogen, phosphorus, and potash compounds. Deer and Peck, of Hawaii, estimate the value of the fertilizer ingredients of Hawaiian molasses at P14 ($7) and the cost of recovery at P6 ($3). The potash in this molasses is much higher than in Philippine molasses.

Table I.—*Comparison of the fertilizer ingredients of Hawaiian and Philippine molasses.*[1]

	Hawaiian Per cent	Philippine Per cent
Potash	3.99	1.65
Phosphoric acid	0 21	0.38
Nitrogen	0 64	0.21

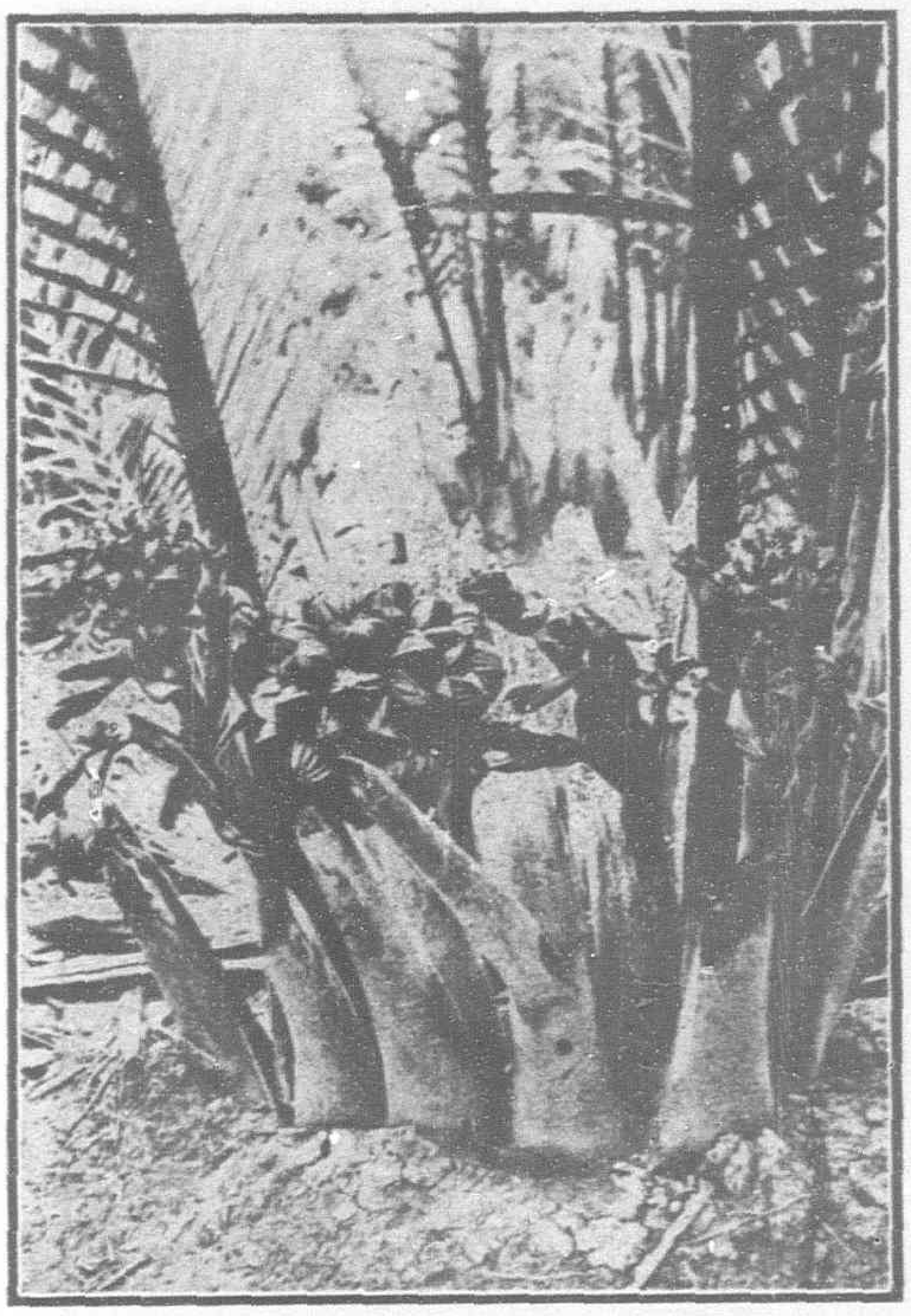
The Philippine Islands exported 211,012,017 kilograms of sugar during 1915. If all of this had been centrifugal sugar, there would have been produced at the same time approximately 35,000,000 kilograms of molasses. If this quantity of molasses was converted into alcohol, it would produce nearly 12,000,000 liters of 182 proof alcohol, representing a value of approximately P2,000,000 ($1,000,000). In 1914 the Islands produced about 12,000,000 proof liters of alcohol, not much more than half of the above amount. More than 95 per cent of this was made from the sap of the nipa and of the coco palms.

A study of the profits obtained from fermenting molasses under various degrees of efficiency is interesting. The data below are based on a cost price of 6 centavos a gallon for molasses, a sugar content of 62 per cent, a selling price of 17.2 centavos a liter for 182 proof, and a cost of 17.3 centavos for converting 1 gallon of molasses into alcohol.

Table II.—*Profits from the fermentation of Philippine molasses under varying conditions of efficiency*

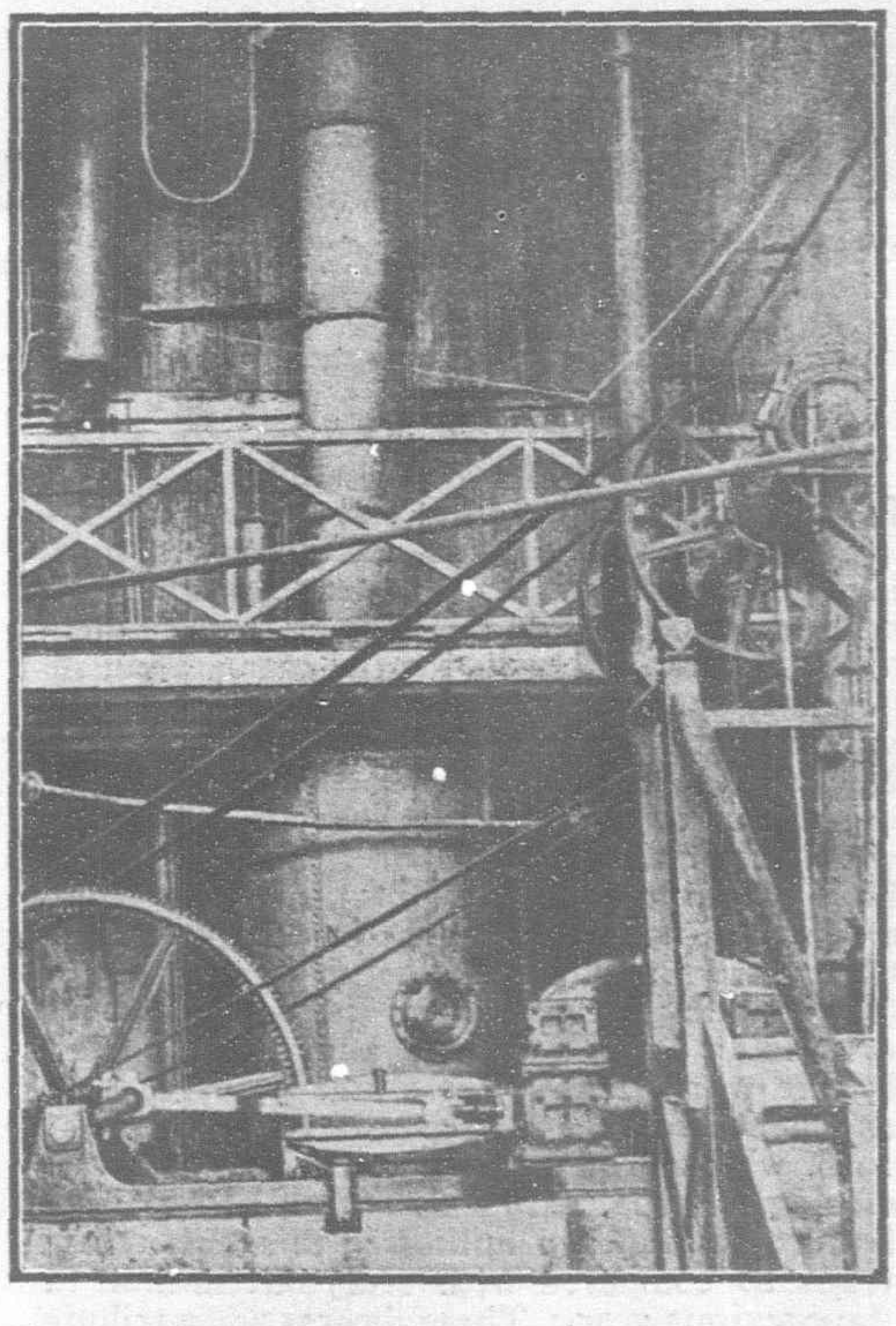
Theoretical yield Per cent	Profit per gallon of molasses Centavos
57	4.5
60	5.7
65	7 6
70	9.5
75	11.4
80	13.3
85	15.3
90	17.2
94.7	19.0

It is apparent that high yields give much greater profits than would at first seem possible, but the disparity arises from the whole increase going to the augmentation of the profits and the cost of production remaining stationary.

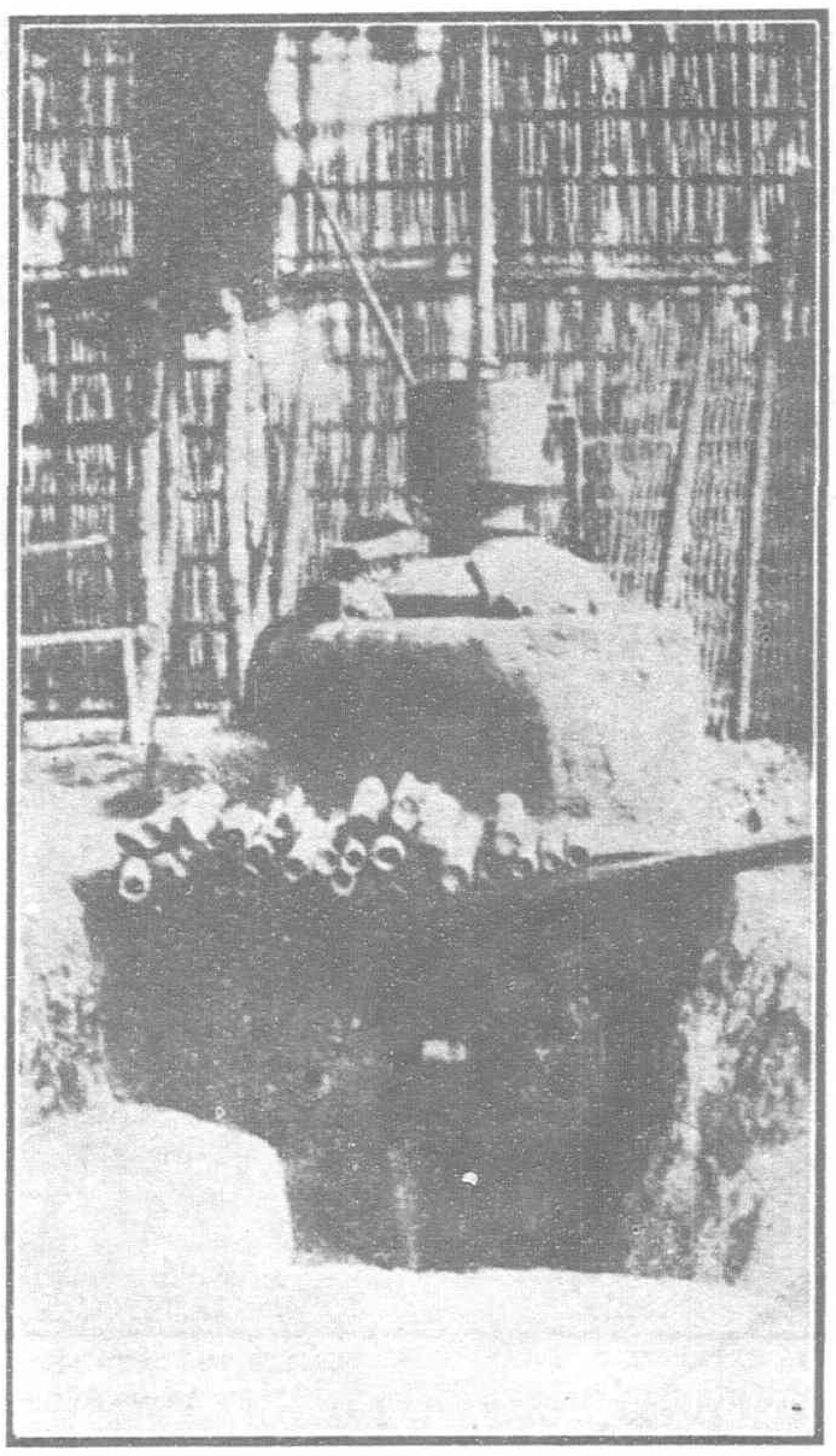


Flower Stalks of the Nipa Palm

The alcohol of the Islands is all used locally—most of it for fermented drinks. The nipa palm offers a cheap source for the production of alcohol. Indeed, as already pointed out, the main portion of the alcohol of the Islands is produced from tuba. A conservative estimate of the number of palms in a cultivated swamp is 2,000 to 2,500 per hectare, of which 750 may be depended on to produce fruiting stalks and consequently be available for sap collection. A stalk normally flows from 30 to 50 liters of sap during a season; the greater portion of the sap flows the first two months. One hectare would produce, during the season, about 30,000 liters of juice with an average sugar content of 15 per cent as it flows from the stalk. The price paid for tuba is about 8 centavos (4 cents United States currency) per



Engine Room of Nipa Sap Distillation Plant



Rude Form of Still Used for Coconut Sap Distillation

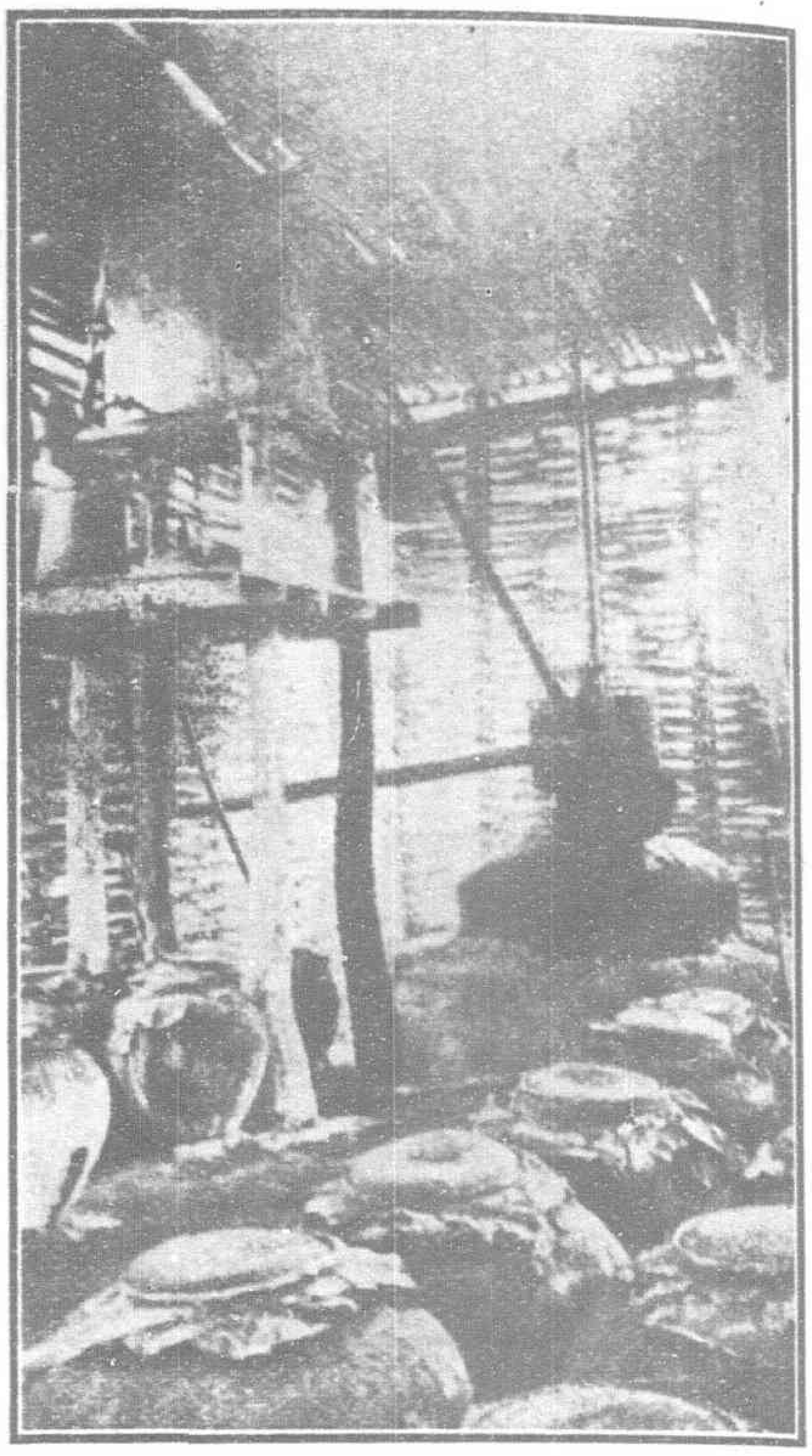
tinaja (30 to 36 liters). Figuring on this basis 1 hectare should yield about 2,350 liters of 95 per cent alcohol during the season. The tuba would cost P80 ($40). If this tuba were sold at 17.2 centavos a liter there would remain P300 ($150) to be applied to the cost of production and profits.

A consideration of the growing of starch plants for the production of alcohol is just as encouraging.

In Mississippi and Florida 1 acre produces 10 tons of cassava. The growing season in the Southern States is eight months; in the Philippine Islands it is twelve months; so it is only fair to assume that the yield here would be as great or greater than in the United States. One acre of corn yielding 40 bushels would give 1,500 pounds of extractable starch, while 1 acre of cassava yielding 10 tons of roots would give 5,000 pounds of extractable starch and in addition the cassava contains from 4 to 6 per cent of fermentable sugars.

Arrowroot yields from 18 to 22 per cent of starch. These roots are no more difficult to handle than are ordinary potatoes. Continental Europe has found these to be a cheap source of alcohol.

The cheapest sources of alcohol in the world—discard molasses, various palms, and starch plants—are located in the tropical countries. These regions are only awaiting development, when they will practically obtain a monopoly of the alcohol industry.



Still Showing Condenser of Water-Cooled Pattern at Left

Coconut Trees Connected by Runway to Facilitate Gathering of Sap

Exterior of Coconut Sap Distillery, Showing Pipe of Bamboo for Cooling Water

PHILIPPINE TRADE

(*Continued from Page 713*)

for 1916, and, with a total closely approximating forty million pounds, established a new high record in the export trade by several million pounds, while better prices contributed to the favorable returns for the year. Spanish purchases, which dominate the trade, were resumed in unusual volume, and shipments to the Netherlands assumed noteworthy proportions, in addition to which those to the United States were larger than ever before, though still of little importance in the total. In the cigar trade there was also marked activity, due to the greatly increased American demand,—the long-standing trade with other countries continuing to be generally adversely affected by the war. There was a steady increase in shipments to the United States throughout 1916, which grew exceptionally heavy in the closing months, with a new high record of a hundred and eleven million in this fluctuating trade as compared with sixty-one million in the previous year. These figures are a tribute to recent insular legislation and government efforts to popularize the Philippine cigar in the United States and overcome conditions that have unfavorably affected its introduction. The average price to the American market continued to decline and was the lowest since the establishment of free trade,—suggesting disproportionally increasing shipments of lower grades.

Minor manufacturing industries shared in the general export prosperity of the year. The development of the so-called household industries of the islands has been the subject of special efforts of the government. Under the educational system emphasis has been put on lace-making and embroidery, and fruits of these efforts are manifest in a noteworthy growth in exports of embroideries to the United States. Advantage continued to be taken of disturbed conditions in the normal European sources of supply, and the Philippine product was exported to the American market to the value of over a million dollars, and more than three times that of the previous year. The Philippine hat industry, which boasts hand-made products of distinctiveness akin to that of Panama, more than doubled the value of its 1915 exports, and established a new high record with a trade exceeding six hundred thousand dollars. This was a distinctly American trade, and the same was true of a minor but increasing export of pearl buttons,—an increase offsetting the reduced export of the local raw material, the Sulu shell. Greater sawmill activity was indicated in a doubling of the value of lumber exported, which amounted to about half a million dollars. With the development of the industry, Philippine lumber is increasingly supplying local needs, and exports far exceed the reduced imports for the year. The value of Philippine woods for cabinet purposes has been frequently emphasized, and that they are finding American favor is shown by the bulk of the larger trade being still with the United States, though there were also shipments of some importance to China, a near-by and unlimited market for building materials.

ENGINEERING, FINANCIAL AND INDUSTRIAL NEWS

RAILWAYS

Canton-Kowloon Line.—Mr. H. P. Winsloe, Manager of the British section of the Kowloon-Canton Railway, says in his annual report on the working of the line in 1916:—

The expenditures of all departments have been carefully watched, and with the exception of the excess of $10,020.58 under locomotive expenses, subhead fuel, which was due to an advance in the price of coal, the estimates have not been exceeded, and this sum was reduced to $4,059.76 by savings under other heads of the locomotive expenses. In spite of the increased cost of coal the percentage of expenditure to gross receipts shows a decrease of 5.45% when compared with the previous year. The working expenses amounted to $296,691.63 against an estimate of $313,905.

The revenue derived from through passenger traffic was $192,858.29. It was not to be expected that the estimated figure of $250,000 would be reached in view of the unsettled conditions prevailing in the Kwangtung province.

The through goods traffic amounted to $18,407.50 or about 34% more than the previous year and it is hoped that with the establishment of the goods agency this traffic will increase.

The local passenger receipts show an improvement on 1915. The increase in first and second class is largely due to the golfing traffic.

In February the star ferry rates for railway passengers using the ferry were considerably raised and the increase was dated from 1st February, 1915. During the year a sum of $20,266.09 was paid to the company, $5,623.64 of this amount being in respect of traffic from 1st February, 1915 to 29th February, 1916.

The local goods traffic revenue is slightly below that of 1915. The increase under sundry traffic is due to the inclusion of rent collected in respect of reclaimed land let at Hung Hom.

Compared with 1915 the gross receipts for the year were $366,215.67 as against $343,769.08 or an increase of $22,446.59 and the working expenses $296,691.63 or $574.34 less. The balance after paying working expenses stands at $69,524.04 or $23,020.93 more than the previous year.

Chaochow-Nanchang Project.—According to Japanese reports negotiations are going on between the Chinese Government and a Japanese company interested in China for a loan of about Y.100,000,000 for the construction of a railway between Chaochow (Swatow), Kuangtung, Nanchang, in Kiangsi. The projected line would be 200 miles long, reports the "*Hochi*," which paper says that, as many difficulties are in the way, it will take some time before the negotiations are concluded. This project would connect the Yangtze at Kiukiang with the sea at Swatow, that part of the railway from Kiukiang to Nanchang having been completed by a Japanese company some time ago. As Swatow lies almost due south of Kiukiang, the proposed line would probably pass through a good protion of Fukien and Kiangsi provinces.

Repairing Flood Damage in Honan.—According to special correspondence of the China Press at Kaifeng, after weeks of interruption to traffic on account of floods, trains are now running regularly on all Honan lines except from Cheng Chow to Peking. There is only one train daily on the Lung-Hai Railway east and west to Hsuchowfu, the night train having been taken off. Travelers from Hankow to Peking must change at Hsuchow for Tientsin. The damage on the Peking-Hankow line was so serious that the engineers estimated late in August that it would be two months before through traffic can be resumed. Between kilometers 193 and 265 there are innumerable breaks caused by embarkments and bridges being washed away. The long bridge over the Shaho is down and one of the 90 feet iron spans was carried a mile down the river. Between kilometers 503 and 557 there were many breaks and the bridge near Shuntehfu was damaged.

Ssupingkai-Chengchiatun Railway.—Mr. M. Takenaka, formerly of the South Manchuria Railway Co., who was confirmed as Traffic Manager of Ssupingkai-Chengchiatun Railway, stated recently that owing to the assistance willingly given by the S. M. R. Co., the construction work of the Ssupingkai-Chengchiatun Railway has made satisfactory headway and that traffic between Ssupingkai and Pamiencheng will be commenced in the middle of October. The whole line up to Chengchiatun may be opened to traffic during the present year. The agreement with the S. M. R. Co., for borrowing about 50 cars, as requested by the Ssupingkai-Chengchiatun Line, was signed on September 6. With the starting of traffic, a Traffic Department is to be established with a staff of about 150 officials, etc. Six officials are to be engaged to look after operation of trains, rolling stock, traffic, etc. As for the other officials, etc., Chinese have been appointed. Stations are to be erected at Pamiencheng, Fuchiatun, and Sankiangkou, and in course of time at Ssupingkai and Chuchiatun. Work has been taken in hand already at Pamiencheng. Pending the formal opening of traffic, passenger accommodation by construction trains has been inaugurated, the traveling section to be extended as the costruction work progresses.

Amalgamation of Siam's Railways.—The Siamese Northern and Southern Railways, which up to the present time have been under separate management, have now been placed under a commissioner general of State Railways, and at the same time Mr. Henry Gittins, controlling engineer of the Southern line, has been appointed adviser to the new office. The Prince of Kambeng Bejra, who about two years ago made an extended visit to the United States, has been appointed commissioner general of the amalgamated railways.

SHIPPING

Hongkong Shipping Report.—In spite of war conditions and of the restriction of tonnage the world over, the total tonnage of shipping entering and clearing Hongkong in 1916 exceeded the entries and clearance of 1915 and amounted in actual tonnage to substantially the pre-war record of the port. The total number of vessels entering and clearing during the year was 642,794 of 36,381,457 tons, as compared with 531,602 vessels of 33,884,919 tons in 1915, and 517,439 vessels of 36,756,951 tons in 1914. Of this shipping, 48,350 vessels of 22,308,311 tons engaged in the foreign trade, as compared with 50,148 vessels of 22,515,023 tons in 1915. Of the entries for last year of vessels in the foreign trade, 30.8 per cent were of British ocean-going steamers, as compared with 32.7 per cent in 1915; 30.7 per cent foreign ocean-going vessels, as compared with 31.1 per cent; 18.5 per cent British river steamers, as compared with 17.8 per cent; 4.7 per cent foreign river steamers, as compared with 4.1 per cent; 1 per cent steam launches, as compared with 1.1 per cent; and 14.3 per cent trading junks, as compared with 13.2 per cent in 1915.

Korean Shipping Increase.—A recent press report states that the total tonnage of ships registered in Chosen now amounts to approximately 47,000. This constitutes an increase of some 32,000 tons since the revision of the shipping regulations in November, 1915. During 1916 nine vessels aggregating 24,156 tons were purchased from the United States, South America, and Norway, and registered in Chosen. Registry of three vessels of some 13,053 tons was transferred in the same year from Manchuria.

Korean Harbor Works.—Among items incorporated in the supplementary budget for Chosen introduced into the Japanese Diet are: Extension of Pyeng Yang colliery, $626,097; railway construction in Kankyo, $697,900; Fusan Harbor works, $159,520; and customs construction, $34,895.

The construction of the Chemulpo Harbor works has been making satisfactory progress lately, and it is reported that work on two lock gates will shortly be commenced. Mr. Benjamin B. Dumoille, an American civil engineer who was connected with the construction of the Panama Canal, has been engaged for this work by the Public Works Bureau of the Government General and arrived in Chosen last month. It is expected that the work on which he is engaged will be completed in about six months.

Shipping Operations in Bangkok.—Negotiations have recently been completed by the British India Steam Navigation Co. (Ltd.) for the lease of a site in a prominent shipping center on the river front in this port, with a view to the erection of spacious godowns and wharves for the accommodation of its steamers, the number of which has been considerably augmented during the last two or three years.

Osaka's 15 Shipyards Busy.—In Osaka there are at present fifteen shipbuilding yards. The ships now being built there number thirty-seven, totaling 76,316 tons. Of the thirty-seven ships thirty are steel and seven are wooden. The steel vessels range from 1,000 to 12,000 tons, but the wooden are from 400 to 1,200 tons. In these shipbuilding yards in Osaka 9,550 workmen are employed, an increase of two thousand since the end of last year.

Launchings in Japan.—Three steamers were launched last month, a 5,600 tons vessel built at the Kawasaki Dockyard; the *Noro*

Maru, 1,200 tons, at the Osaka Iron Works; and the *Arichi Maru*, 3,150 tons, at the Innoshima dockyard of the Osaka Iron Works. The steamer *Horai Maru*, 6,500 tons, now under construction at the Osaka Iron Works, will be launched on September 4.

Japan's New Shipping Regulations.—The features of the shipping control regulations have been decided by the Cabinet and were referred to the Privy Council on September 6. They are:

(1) Ships registered with the Imperial Japanese Government shall not be transferred, chartered, or mortgaged without the permission of the Government. Shipyards within the dominion of the Empire shall be prohibited to build vessels for owners who are not qualified to have their vessels registered with the Imperial Japanese Government, without the permission of the Government.

(2) Such shipbuilding firms shall not be allowed, without the permission of the Government, to receive orders for ships from a party who is not qualified to register them with the Imperial Japanese Government.

(3) Vessels registered with the Government shall not be allowed to run exclusively between foreign ports without permission.

(4) The Minister of Communications, when deemed necessary, may forbid or restrict passenger or freight traffic between foreign ports by vessels registered with the Government.

(5) The Minister of Communications, if necessary, can appoint the route for such ships.

(6) The Minister of Communications, if necessary, can regulate the freight rates for such ships.

(7) The Government, if necessary, can commandeer or use such ships or such shipbuilding companies' yards by paying compensation therefor.

Japan's Naval Expansion.—Continuation of Japan's naval expansion will come up in the next session of the Imperial Diet in the form of another big construction program, reports the Hochi. This newspaper says that when the Diet convenes in December, the Navy Office will introduce a bill providing for the construction of 32 submarines, 20 destroyers, and five cruisers, at a total cost of 150 million yen. The program will cover four or five years, beginning the next fiscal year. The undersea craft are to be between 800 and 1,200 tons.

Pacific Mail's India Line.—Plans for a more extensive trans-Pacific service were announced recently by Mr. William A. Young, Jr., general passenger agent of the Pacific Mail Steamship Company. Concerning the inauguration of the new Calcutta-San Francisco line Mr. Young said the fullest support has been given by American merchants in Manila, which city is fast increasing its reputation as one of the most important ports for the American foreign trade in the Far East. Mr. Young said that the new service between San Francisco and Calcutta will be operated monthly with three ships in commission, including the Santa Cruz, the Colusa and one other. Among the ports these three ships are scheduled to call on, the outward trips are: Manila, Singapore, Calcutta, and Colombo; and on the homeward trip at Singapore, Manila, Cebu, Honolulu, and back to San Francisco. The ships will not come to Japan and China. There is said to be no significance in omitting calls by these ships in China and Japan other than trade relations between the United States and the Far East which have made it impossible to extend this line to Japan and China.

FINANCE

Chinese Bank at Hongkong.—A bank known as the "Industrial and Commercial Bank (Ltd.)" has been organized under the laws of Hongkong with a capital of $1,000,000 currency. The plans of the company contemplate ultimate capitalization of as much as $50,000,000 and the establishing of branches and agencies all over China, with a view of affording Chinese commerce and industry modern banking facilities, which are lacking in interior districts at present. The head of the new enterprise is Mr. Tien Tan Cheng, a graduate of the University of Chicago, and among other promoters are Mr. Jun Ke Choy, a graduate of Columbia University; Mr. Wai Man Lau, Mr. Chang Huan, and others who have had American university and commercial training. Most of the promoters have had more or less connection with the government of Kwangtung province in recent years. The capital of the new concern has been raised by more or less popular subscription, much of it coming as a result of a recent visit to the United States of the chief promoter, who took advantage of his stay in the United States to study American banking and financial methods.

Chosen Bank Expands.—It is reported that the issue of the 30,000 new shares of the Bank of Chosen, authorized at the last semi-annual meeting has been largely oversubscribed. The total number of subscriptions received was for 105,462 shares, the number of applicants being 3,137. All subscriptions at $64.80 or above were accepted, while 60 per cent of the applications at $64.30 were also accepted. All other offers were rejected. The par value of each share is 100 yen.

Siam's Budget for 1918.—The budget figures for the Siamese fiscal year ending March 31, 1918, have just been published in the Official Gazette. The ordinary revenue is estimated at $26,690,078, an increase of $827,078. as compared with the estimate for the fiscal year ended March 31, 1917. The estimated ordinary expenditures are figured at the same amount as that of the revenue. The expenditures to be met from sources other than current revenue amount to $7,384,155, exceeding last year's record by $563,279. The special expenditures, amounting to $7,387,155, are provided for by $4,939,573 from the treasury reserve fund, by $2,144,150 from foreign loans, and by $300,433 from the sinking fund. The close of the fiscal year 1917 was marked by the final suppression of the remaining gambling houses in Bangkok, an event which involved a yearly loss in current revenue of $1,182,520; and as a similar loss in the Kingdom's income was sustained by the doing away with the lottery farm in the previous year, it may be concluded that Siam's revenues from other sources are in a prosperous condition.

Hongkong Finances.—Increased duties on alcoholic products and increased price of opium and the imposition of a duty on tobacco product brought Hongkong's income up considerably in 1916. The total revenue for the year, according to the report of the Colonial Treasurer, amounted to $13,833,387, being $2,424,377 in excess of the estimate and $2,047,280 more than the revenue in 1915. The most important increase included Sunday cargo working permits, $51,000; liquor duties, $163,000; opium monopoly, $1,560,000; stamp duties, $66,000; land sales, $200,000; and tobacco duties, $211,180.

The total expenditure amounted to $11,079,915, being $802,859 less than the estimate and $4,069,353 less than the expenditure in 1915. The revenue for the year exceeded the expenditure by $2,753,472, with the result that the debt balance of $452,687 at the end of 1915 became a surplus of $2,300,785 at the end of 1916. Toward the end of 1916 an ordinance was passed to raise a loan of $3,000,000 as a war contribution to the Imperial Government. Of this $2,250,000 was paid up on December 30.

Kyoto Loan Floated.—The issue of the Kyoto metropolitan loan of 18,500,000 yen was closed on August 28 with satisfactory results. The subscription by cities was as follows: Kyoto, 8,000,000 yen; Tokyo, 5,000,000 yen; Osaka, 2,600,000 yen; others, 3,900,000 yen.

Siamese Government Savings Bank.—The recently published report of the third year's working of the Siamese Government Savings Bank gives the balance on hand for the fiscal year ended March 31, 1916, at 600,694 ticals ($222,257), against 375,614 ticals ($138,977) for the corresponding period of 1915. During the year there were 906 new depositors, and at the close of the year the total number was 1,930.

The average savings of the people on current accounts was 104 ticals ($38) for each depositor and 206 ticals ($76) on fixed deposit accounts, while during the year the current accounts on an average increased by 14 ticals ($5.18) and the fixed deposits by 13 ticals ($4.81). The interest paid to depositors amounted to 14,057 ticals ($5,201), an increase of 5,891 ticals ($2,180) over that of the preceding year.

Japanese Budget Decrease.—The general estimates of the Home Office for the next fiscal year, it is understood, were approved at a meeting of the leading officials of the Department on August 22, and will be sent to the Finance Department at the end of the month. The total amount of the appropriations demanded has decreased by more than 23,000,000 yen compared with last year, because, as the result of the establishment of the Colonial Bureau, the colonial estimates have all been excluded from the Home Office estimates. About 10,000,000 yen, however, will be demanded for new undertakings, including the establishment of a bureau concerned with labour and other social questions, and schemes for better treatment of local officials.

Japan Specie Holdings.—The specie of Japan as standing September 3 was Y975,000,000, of which Y314,000,000 is held by the government, and Y661,000,000 by the Bank of Japan. Of the total, Y423,000,000 is at home and Y352,000,000 abroad.

U. S. Gold Embargo Hits Japan.—The report that the United States Government had prohibited the shipment of gold has been officially confirmed and at the same time it is made clear that Japan is also affected by the latest drastic war measure of the United States. An official message received by the Foreign Office in Tokyo from New York says that President Wilson proclaimed under date of September 7 the prohibition of the shipment of gold and silver coins, gold and silver bullion, and all other kinds of legal tenders of the United States for export purposes from September 10, except under special license by the Government. The grant of licenses for the shipment of gold and silver is controlled by Mr. McAdoo, Secretary of the Treasury, with the advice of the Federal Reserve Board.

In addition to this proclamation of President Wilson it is stated by official message that it is observed in New York that the sharp increase lately made in the remittance to Japan, Mexico, and Spain has principally induced the Government of the United States to effect the drastic measure. According to press reports, during the five weeks ended August 17, $73,000,000 worth of gold was exported. The amount represents 4 per cent of the whole amount received by the United States. At present the American possession of gold comes up to $3,000,000,000, 40 per cent of which has been acquired since January, 1915. The total gold acquired since the beginning of this year is $538,000,000 against $300,000,000 exported, which is two times the total exports made last year.

A Japanese treasury departmental ordinance issued on September 5, prohibits the export of silver bullion without the permission of the government.

Mining Bank tor Korea.—In Korea there have been many applications to the authorities for permission to work mines, but there have been very few projects actually launched. One of the principal reasons for this is said to be the lack of financial facilities. Experts calculate that unworked mines in Korea are worth about Y.100,000,000. In view of the bright prospects of the mining industry in the peninsula, it is reported that some bankers in Japan are projecting the establishment of a bank for the exclusive purpose of financing Korean mining industries.

China Gets New Loan.—Of the Y.10,000,000, loan, the first instalment was paid on September 6, that is, Y. 600,000 at Peking and Y.1,670,000 at Shanghai, all in demand drafts. Of the balance, Y. 500,000 will be paid China at Peking and the same amount at Shanghai each week until the whole loan is paid. On September 6, $3,800,000, being the surplus revenue collected by the Salt Administration, was released to the credit of the Chinese Government.

Would Increase Philippine Revenues.—A revision of the customs law of the Philippine islands in such a manner that an additional P2,000,000 in duties will be collected during a normal year, is recommended by Dr. Bernard Herstein, formerly of the board of public utility commissioners. Since his departure from the islands he has been studying the customs question. The matter will require action by the local legislature as well as final approval by the president of the United States, and a special meeting of the senate committee of finance has been called to consider it.

MINES AND METALS PRODUCTION

Siberian Iron Industry.—It is announced that the Abakansk Iron Works have been purchased by a Swedish financial group. These iron works are situated near Minussinsk on the upper Yenisei River and had been abandoned, owing to the lack of sufficient capital and means of transport. It is the intention of the purchasers to enlarge the works considerably and to install the necessary equipment for the manufacture of agricultural implements and machines on a large scale. The Atchinsk-Minussinsk Railway which is now nearing completion, passes close to the works. The deposits from which the iron ore will be obtained have been worked in a desultory way since 1885. These deposits are said to contain 12,000,000 tons of ore. The ores are magnetic, and yield 66 per cent of iron. The Abakan River affords excellent facilities for the transport of the ores and coking coal is also close at hand. Coal from the Kuznetsk basin can also be utilized. In addition to this development of the Abakansk Iron Works another company is planning the establishment of a large metallurgical and coke factory near Kuznetsk. Hitherto the supplies of iron required for western and central Siberia have been obtained for the most part from the Ural district of South Russia. The development of the above undertakings, however, should result in the production locally of many of the iron products that are required in the territory, such as agricultural implements, steel rails, mining machinery, iron roofing sheets, etc.

Copper and Gold in Russian Asia.—A firm interested in copper mining has reported the discovery in the Tchernaef district of Central Asia of extensive deposits of copper ores with a reported richness of 20 to 60 per cent of metal. In the neighborhood of Tchimgan, 60 miles from Tashkent, Central Asia, gold deposits are reported to have been accidentally discovered. It is asserted that the assays have disclosed a high percentage of metal in the ores and washings that have been recovered. Some observers in this territory believe that gold-bearing strata will be found near these fields.

New Iron Foundry Planned.—In view of the ban on iron goods by the American Government Mr. S. Asano, president of the Toyo Kisen Kaisha and the Asano Shipbuilding Yards is now contemplating to launch a large iron foundry the site of which will be between this city and Yokohama in order to turn out about 100,000 tons of pig iron annually for the supply materials to steel industry. Since he has extensively imported steel and iron prior to the American ban he was able to build ships at the shipbuilding yards at Tsurumi and was able to proceed with the work without any hitch. However, there are many parts for the construction of ships found to be wanting which may be prohibited from shipment any moment. With such a situation in view and the passing of the Government bill for the encouragement of iron industry in the meantime Mr. Asano has finally resolved to carry out his plan centralized in the Nippon Steel Tube Company. This firm is located near Kawasaki and has been under the management of Mr. Shiraishi, his son-in-law; but in order to add a iron smelting plant, experts have been engaged. Mr. Asano plans to establish the new foundry in front of the shipbuilding yards by reclaiming grounds, which concession he is said to possess already.

Coal and Tin in Dutch East Indies.—The Government coal mines of Ombilien, west coast of Sumatra, produced 481,979 tons of coal during the year 1916, against 433,177 tons in 1915. The Government coal mines of Poeloe Laoet, east coast of Borneo, produced 124,105 tons, compared with 102,118 tons in 1915. The output of the Government tin mines of Banca Island, Dutch East Indies, in 1916 was 12,230 tons of tin, against 16,200 tons in 1915.

Barytes in Manchuria.—Barytes is being mined on a large scale near Pulantien, in the Kwantung leased territory in Manchuria, by a company of Japanese residents at Pulantien. The corporation is called the Manchuria Barium Co., and is capitalized at $25,000.

Rare Metal Ores in Japan.—The following figures give the output of rare metal ores in Japan as officially estimated for 1916, compared with the statistics for 1915, and the estimated exports:

Ores	1915	
Output	Pounds	Value
Antimony...	18,490,615	$4,082,709
Molybdenum	24,733	22,079
Tin	759,325	264,944
Tungsten	827,950	238,258
Exports		
Antimony...	19,209,472	3,842,150
Molybdenum	16,400	27,755
Tungsten	1,074,800	229,331
Output	1916	
Antimony...	27,333,333	$7,726,750
Molybdenum	74,167	29,910
Tin	562,666	226,818
Tungsten	1,358,333	747,750
Exports		
Antimony...	19,978,643	4,724,049
Tungsten	1,194,933	417,132

The excess of exports over output in 1915 in some of the items is explained by the fact that large stocks were released early in the year following the rise in prices consequent upon the outbreak of the European war.

Percentages of metal in the ores are: Molybdenum, average 40 per cent (superior 60 per cent); tin, average 40 per cent (superior 78 per cent); antimony, average 60 per cent (superior 71 per cent); tungsten, average 60 to 65 per cent (superior 78 per cent).

Tonkin's Mineral Output.—The exports of minerals from the port of Haiphong during the first four months of 1917 were: Zinc, 10,566 metric tons; tin and wolfranite, 190 tons; and antimony, none, compared with 12,342,160, and 498 tons, respectively, for the corresponding period in 1916, which year was favorable for the mineral industry of Tonkin. In spite of an increased local consumption, the exportation of coal probably equaled the 1915 figures—about $1,850,000. Coal is now third in value among the exports of Indo-China, having passed maize in 1914 and hides and leather in 1915. The value of zinc exports advanced from $463,000 in 1914 and $836,500 in 1915 to about $1,000,000 in 1916. Zinc is increasing in importance among the exports of this district. In 1916 most of it went to Japan. About 12,125 tons was sent to the United States. Cement exports, which amounted to $474,000 in 1914 and $614,000 in 1915, probably exceeded $750,000 in 1916.

It is difficult to estimate the value of the tin and tungsten ore shipped from Saigon. The customs figures give the amount exported in 1914, 1915, and 1916 as 216, 397, and 331 tons, respectively. Even if these figures are exact, the export value cannot be calculated precisely because of the varying quality of ore. The customs value of this ore is placed at 600 francs a ton—very low for the present price of the metal. Perhaps $175,000 would be a fair estimate of the market value in 1916. The amount of antimony exported in 1916 was 785 tons, against 630 tons in 1915 and 883 tons in 1914. The customs value in 1916 was about $30,000. Salt and gold and silver ore are exported from Tourane. The value of salt shipments fell from $93,460 in 1915 to $59,393 in 1916. The exportation of gold and silver ore amounts annually to between $50,000 and $100,000.

Siam's Tin Exports.—The approximate value of the 151,175 piculs (20,156,667 pounds) of tin exported from Siam in the fiscal year ended March, 1916, was 21,101,900 ticals ($7,807,703 gold). The actual percentage of metallic tin in the ore cannot be ascertained, but for revenue-collecting purposes the Siamese Government reckons the tin ore which is exported from the east coast of the Malay Peninsula as containing 65 per cent, and that from the west coast 70 per cent metallic tin.

According to a Bangkok mining engineer, from 40 to 60 tons of tungsten ore are mined monthly in the Siamese Malay States, the ore containing from 60 to 72 per cent of WO_3. The local average price of the ore per picul (133⅓ pounds) was about 131 ticals ($38) during last year, but the price varies according to the WO_3 units contained in the ore.

Iron Works in the Urals.—The British consul at Ekaterinburg, Russia, reports that a local firm of engineers, which before the war dealt entirely and on a large scale in German machinery and tools, has recently rented about 120 acres in the vicinity of Ekaterinburg, on which it is proposed to erect large metallurgical works. The erection of these works, it is stated, has been decided upon after tests with Ural iron were made abroad with excellent results.

Russian Platinum Production.—According to the British consul at Ekaterinburg, Russia, the 1916 output of platinum in the Urals amounted to 86,500 troy ounces, about three fourths of the output in 1915. The chief causes of the decline in the production of platinum are the shortage of labor, the difficulty in obtaining spare parts for dredges, and the exhaustion of the richer alluvial deposits. New alluvia will undoubtedly be found when extensive prospecting is resumed.

Gold Output of Korea.—During last year, says a report, gold obtained from the Unsan, Suan, and Changsong Mines was valued at 3,160,000 yen, 2,150,000 yen, and 1,000,000 yen respectively. Besides this, the Bank of Chosen purchased 2,760,000 yen worth of gold from West Chosen, bringing the total output to some 8,000,000 yen. The output from Keusong Mine, worked by the Furukawa Company, and the gold contained in copper ore exported by the Kuhara Firm, being added, the total output of gold in West Chosen during last year reaches ten million yen or more in value. This exceeds the gold production of Japan by one million yen. The total production of gold, not in West Chosen only, but in the whole peninsula during last year, says the *Seoul Press*, was some fifteen million yen in value, the production from West Chosen being added to that purchased by the Bank of Chosen totaling some five million yen. This is fifty per cent more than the total production in the mother country.

The three largest gold mines in Chosen,—Unsan, Suan, and Changsong,—are managed by foreigners. The largest gold mine managed by Japanese, which is working at present, is the Asano Mine in Sunan District, South Pyongando. The Keusong Mine in Keusong District, the same province, and managed by the Furukawa Firm is also prosperous A refinery, though not large, has recently been established and attached to the mine, and the work of the mine is being gradually enlarged. The Hoichang Mine in Songchon District is also regarded as very promising. A greater part of the gold ore produced by these and other mines in Chosen is sent to Japan for refinement. The Kuhara Firm has, however, recently established a refinery in Chinnampo, and the work there is very successful. The Suzuki Firm of Kobe has also been contemplating the establishment of a refinery in Chosen. It is now reported that it has decided to establish it at Noyangjin, a town midway between Seoul and Chemulpo, and shortly start the work.

Oil Fields of Formosa.—The Naval Office has included in its estimates for the next fiscal year an appropriation of Y300,000 for the working of the Ako Oil Field which is the most promising of the five of its kind known to exist in Formosa.

Mining Industry of Japan.—The mining industry of Japan has been meeting with heavy business since the outbreak of the war. The development feature has been centred in copper mines which have risen in price, demand, and output. Following this product comes coal, which has doubled its price when compared with the figures prior to the war. New discoveries have been made of tungsten ores and the like which are among the important elements in industrial development of to-day. The Department of Agriculture and Commerce reports that such mineral outputs this year will be 30,000,000 yen over that of the preceding year. The total output is estimated at 350,000,000 yen. According to the compilations of the Mining Bureau of the Department, the output of the chief minerals during the month and the gain over the corresponding period in the previous year was as follows:

	April		Difference
Gold ...	159,984	momme ...	9.3 per cent
Silver ...	4,296,245	momme ...	9.4 ,,
Copper ...	12,129,203	kin	21.3 ,,
Iron ...	9,963	tons	38.0 ,,
Coal ...	1,945 837	tons	11.6 ,,
Petroleum	197,591	koku	3.5 ,,
Sulphur	8,754	tons	18.3 ,,

To compare the total output with that of the previous year, sulphur increased by 21.1 per cent, copper 18.5 per cent, silver 16.3 per cent, steel and coal 8 per cent each. Gold and petroleum on the other hand decreased by 16.2 and 4 per cent respectively.

Benguet Consolidated Mine.—The Benguet Consolidated Mine has had a highly satisfactory clean-up as a result of its operation during the month of June, according to C. M. Eye, manager of the mine, who arrived in Manila recently with a consignment of 2,208 ounces of the yellow metal, valued at P57,521.-32. Mr. Eye states that this bullion is the result of the milling of 1,735 tons of ore.

Oriental Steel Co. of Japan.—The Oriental Steel Manufacturing Company, is almost a national undertaking, being promoted and backed by nearly a thousand businessmen of note. It is organised to make most of the right to work the Taochun iron mine, Anhwei, leased by the Sino-Japanese Industrial Development Company. At its promoters' meeting in Tokyo recently Mr. Buyei Nakano, president-elect, presented a report on the work of the promoters' meeting in the past and recommended the draft articles of association, which they adopted. The capital will be divided into 600,000 shares, of which 500,000 shares will be assigned to promoters and supporters, while 100,000 shares will be offered for public subscription.

In allotting the public subscriptions the promoters will accept only tenders above 50 shares, which will limit the number of general shareholders to 2,000. The site for the prospective mills is not decided, but it is believed that Imari will be the site selected.

F. M. S. Tin Exports.—Statement of block tin and tin ore exported, approximate value (in Singapore) and duty collected, during the months of January to June, 1917, and comparison with corresponding period of previous year is as follows in piculs of 133⅓ pounds and Straits dollars of 56.78 cents gold:

Block tin, 1917, 45,208; 1916, 39,119; tin ore (72 per cent of gross weight), 1917, 286,-620; 1916, 325,863. Total tin, 1917, 331,828; 1916, 364,982; decrease, 33,154. State, total approximate value (in Singapore), 1917, 33,-115,239; 1916, 32,889,476; increase, 225,766.

Smelting and Refining in Korea.—Mr. A. H. Lay, British consul-general at Seoul reports that the mineral and metal industries of Korea are at present exhibiting interesting developments. Sai-nei is the location where the iron mines owned by the Japanese Government are situated. There mines produced 73,611 tons of ore from January to September, 1916. The ore is shipped to the Government iron foundry at Wakamatsu. The Mitsubishi company also owns iron mines at Sai-nei, but these have not yet started producing. This company is erecting an iron foundry at Kengi-ho in the same locality. Another Korean enterprise, situated at Chinampo, is a large smelting and refining plant for treating gold and other ores by the dry process. The undertaking appears to be successful, and several of the larger foreign mining companies have begun to send ores to this plant to be treated. The plant has recently been enlarged, and is now capable of treating 220 tons of ore per day of 24 hours. A third furance is in process of erection, and when this is in operation the capacity of the entire plant will be increased to 570 tons. The establishment of three new smelting and refining plants is contemplated in Korea; one is to be situated in a suburb of Seoul; the second, which is to be established in the South Kei-sho province at a cost of 380,000 yen, is intended for the treatment of ores produced by many mines in South Korea: while the third is to be established by local mine owners at Shingishin on the Yula River.

Korean Coal Mine.—A company has been formed to work anthracite coal mines which it has recently acquired in the Ko-sai district, South Hei-an province. It is estimated that some 3,000,000 tons of coal are to be found in these mines.

Copper Deposit Near Peking.—At Lung-chuen Shan in the west of Peking there has been discovered a copper deposit covering an area of tens of li and the ore is stated in Chinese press reports to be very rich. The Board of Commerce and Agriculture has sent to investigate the same.

Philippine Manganese Mine.—Owning the richest deposit in the Philippines of manganese ore, Captain Fred Burdette, the veteran mining man, is now extending operations in his properties on Camaguin island, off the north coast of Luzon. For the past year or more Captain Burdette's mine has been turning out a high grade of this ore, especially valuable at this time, owing to its use in metallurgy.

The Seoul Mining Company.—During August 22,280 tons of ore were treated from the Suan and Tul Mi Chung mines, from which was recovered Yen 279,278.00. Mining developments throughout the concession continue satisfactory.

BUILDING

Hankow Building Opeations.—Building operations in the Foreign Settlements have been going on apace, and ferro-concrete is taking an important place in all the new structures. Large repacking establishmets have been erected to deal with such goods as cotton, hides, and other raw materials. The staiking features of these structures are the carefully graded outside stairways leading to the upper floors. No lifts are provided, and the cargo is all carried from the river front by coolie labour. One now sees buildings of flats and offices six and seven stories high and hears of land changing ownerhip at enormous prices. The British Concession has already reached such a degree of congestion that relief is sought in the dimension of height. The reclamation and bunding of a portion of the foreshore in front of the Custom House and Messrs. Butterfield & Swire's property was completed.

Nanking Building Progress.—Building operations were engaged in at Siakwan as in former years, but there does not seem to be as great a demand for new houses as hitherto. The provincial authorities expended a considerable sum in constructing a bund wall along part of the river front at Siakwan. In December a new flour mill started business. The owners propose to enlarge their establishment and extend their operations in the near future. This enterprise is probably but the forerunner of many others, Nanking being eminently suited for manufactures, and a scheme has already been mooted for the erection of a woolen mill at this port.